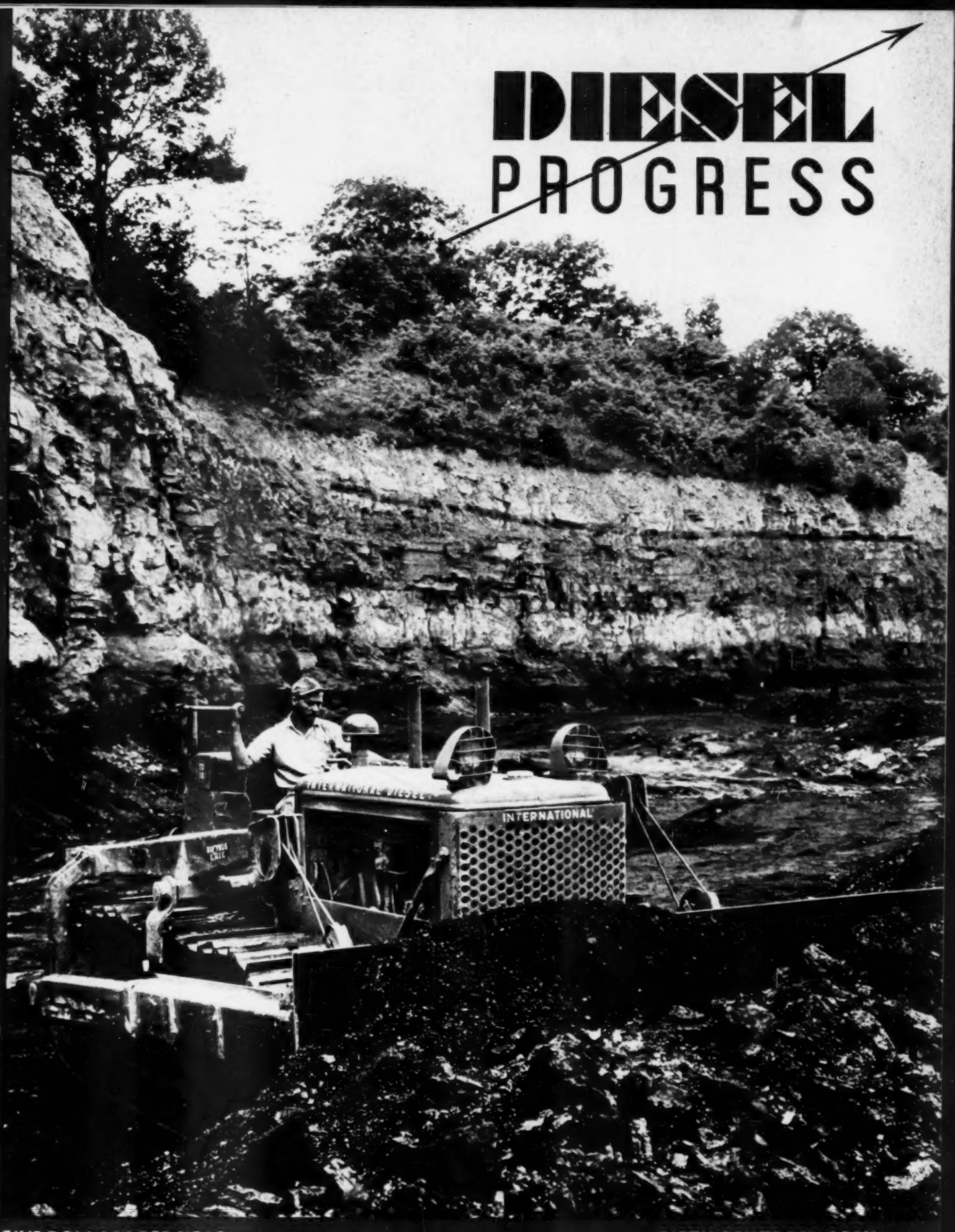
DIESEL PROGRESS

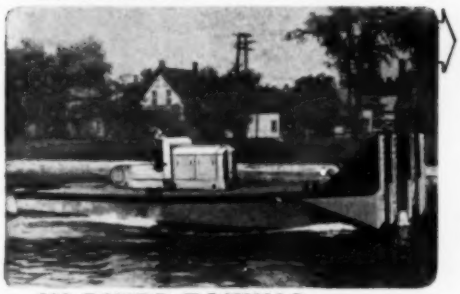
IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR



FIVE DOLLARS PER YEAR NOVEMBER, 1949 FIFTY CENTS PER COPY

DIESEL PROGRESS, for November, 1949 Volume XV, Number 11. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 W. Forty-fifth St., New York 19, N. Y. Rex W. Wadman, President. Subscription rates: $5 per year, single copy 50c. Acceptance under 34.64, P. L. & R., at East Stroudsburg, Pa.

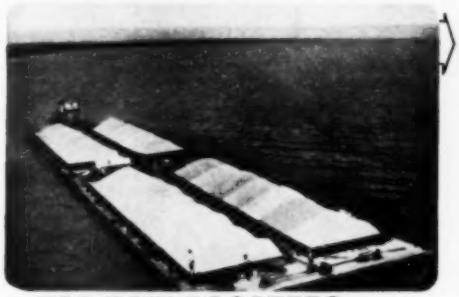
IN HARBOR TOWING...



HARBORMASTERS can save 23% operating time over inboard towing equipment!

Operating facts prove the efficiency and economy of the illustrated Model O-6 (165 h.p. Diesel) harbor towboat. The owner's own figures for a full year's heavy-duty service showed him a 23% saving in operating time, compared with an inboard powered towboat of the same horsepower in the same service.

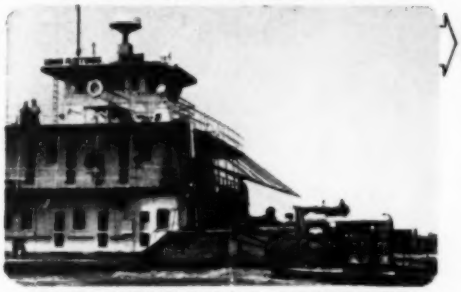
IN RIVER TOWING...



HARBORMASTERS can move more tonnage in less time.

This Harbormaster towboat, now in its fourth year of service, replaced a towboat with inboard Diesel power and rudder steering, on the Berbice River in British Guiana. On this run the inboard towboat was handling 4.8 tons of payload per horsepower. This boat handles 6.1 tons of payload per horsepower, an increase of 27%. The average trip time of the inboard boat was 35 hours; of this boat, 30½ hours, a decrease of 12½%.

FOR TOW BOOSTERS...



HARBORMASTERS can save, after taxes, on reduced running speed alone, enough to repay the original investment in 18 months!

Two remote-controlled Model O-72 300 h.p. Diesel Harbormasters, installed on the stern barges of this 18,000 to 20,000 ton tow, increased its running speed .75 miles per hour. This saving alone, after taxes, amounted to enough to repay the investment in 18 months, according to the customer's figures. The saving on double-tripping eliminated at the same time is additional.

FOR IMPROVED CONTROL...

HARBORMASTERS can increase the total number of trips per season by nearly 50%!

In river and canal operating particularly, improved control offers surprising opportunities for savings. Rudders absorb power. Locking wastes time if full control is lacking. One Model O-62 Harbormaster was installed on the integrated tow "Carutica", shown here, to provide control through propeller-thrust steering. 26 round trips were completed the first season, against a previous average of 18.

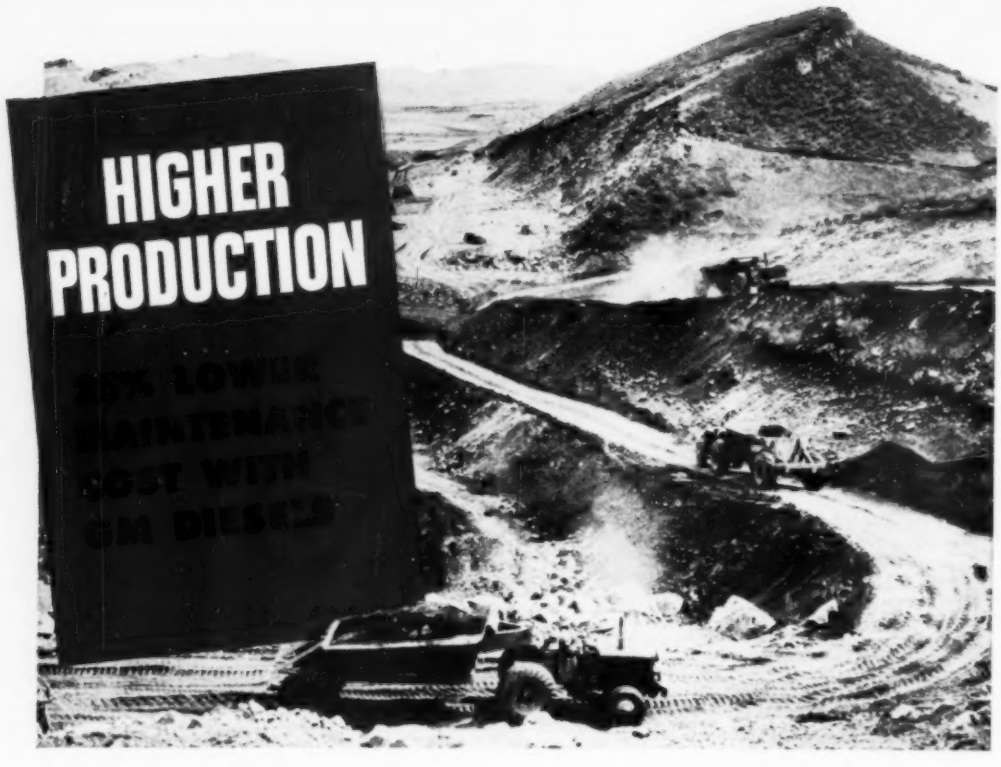
These examples and others, in every type of marine operation, all point to the same conclusion. Heavy-duty outboard propulsion with propeller-thrust steering is a more efficient, more economical system than inboard power with rudders. If you are engaged in marine transportation, Harbormaster equipment can reduce your costs and increase your profits.

It's good management to get the facts. Write us today if you want more information.

MURRAY & TREGURTHA, INC.

High Fidelity Marine Engines since 1885

18 HANCOCK STREET, QUINCY 71, MASS., U. S. A.



HIGH altitude and long haul grades are no problem with General Motors Diesels on the job. That's the profitable discovery made by Grafe-Callahan Company of Fort Collins, Colorado, on the 2½ million cubic yard Horsetooth Dam project on the East slope of the Rockies near Denver.

On the Horsetooth job (altitude 5300 feet) GM Diesel-powered Euclid trucks hauled 11½ yard (19½-ton) loads of wet gravel up 10% grades on 6-mile round trips averaging two trips per hour.

Starting with two GM 6-71 Diesel replacement engines, Grafe-Callahan purchased 8 new GM Diesel-powered Euclids and finally converted all 16 of their units to General Motors 2-cycle Diesel power.

Job manager Joe Seabury—a man whose opinion is worth noting—states, "I am being very conservative when I say that our maintenance costs have been cut 25% since we switched to GM Diesels. They stand up better and are much easier to work on. They have given us very good performance on this job."

When you need earth-moving machinery, or any heavy construction equipment, look to the *power*. Insist on GM Diesels and get more work done at lower cost. Write us or ask your construction equipment distributor for details.

DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES... Up to 200 H.P. **DETROIT 28, MICHIGAN** MULTIPLE UNITS... Up to 800 H.P.

GENERAL MOTORS

DIESEL BRAWN WITHOUT THE BULK

GM GENERAL MOTORS DIESEL POWER

Here's an International Diesel hard at work . . .
its power protected by a Purolator Oil Filter

Keep dirt from making a landing in your engines . . .

What a spot for an engine breakdown . . . dirt and grit flying into the oil stream on this airfield construction job!

Here—and under any rugged operating conditions—your surest protection against engine wrecking abrasives is a Purolator Micronic Oil Filter.

For Purolator engineers designed the accordion-pleated *Micronic* element to filter particles measured in *microns* (.000039 of an inch) . . . and trap 290% more abrasives than ordinary oil filters. And Purolator's filtering surface is 5 times that of old style filters so that longer refill life is assured.

For fuel oil filtration . . . all these advantages add up to the *complete* job so vital because of close tolerances of injector plungers, and the microscopic size of injector tip orifices. And for *lube oil* filtration . . . Purolator's greater efficiency assures less wear on hard-working bearings and other parts.

Further information—as well as specialized help with your *particular* filtering problem—yours for the asking.

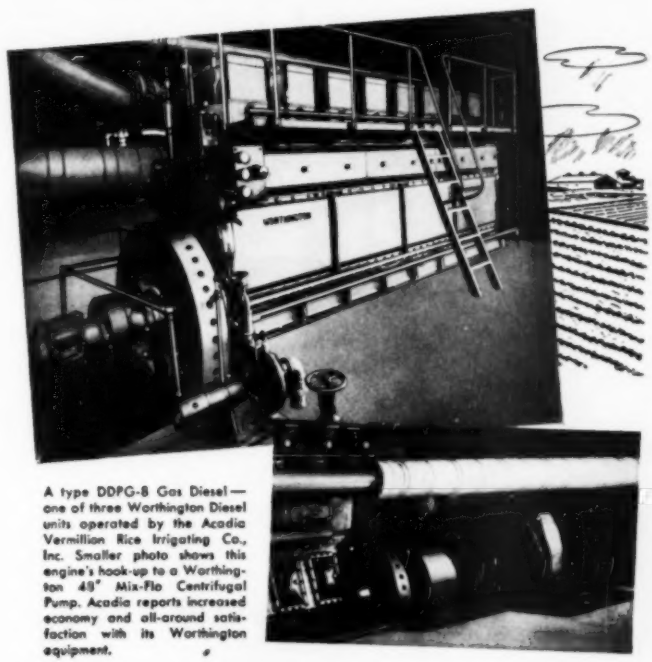
PUROLATOR PRODUCTS INC.

Newark 2, New Jersey; and Windsor, Ontario, Canada

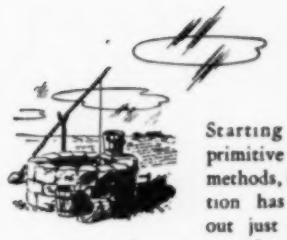
Protect your Power with Purolator!

PUROLATOR
MICRONIC OIL FILTER

LOOKING FOR EFFICIENT, COST-CUTTING POWER?... ASK THE INDUSTRY THAT'S *"Tried Everything"!*



A type DDPG-8 Gas Diesel—one of three Worthington Diesel units operated by the Acadia Vermillion Rice Irrigating Co., Inc. Smaller photo shows this engine's hook-up to a Worthington 49" Mix-Flo Centrifugal Pump. Acadia reports increased economy and all-around satisfaction with its Worthington equipment.



Starting with primitive hand-methods, irrigation has tried out just about every type of power ever developed. That's why the experience of this industry — as old as agriculture itself — should prove of especial interest to *you* in your own search for efficient, economical power.

At Milton, La., for example, the Acadia Vermillion Rice Irrigating Co., Inc., operates a pumping station with a capacity of 350,000 gpm. Supplementing older steam-driven equipment, the company has added three Worthington Diesels: two Type DD-8 Oil Diesels, installed in 1939 and 1942, and a Type DDPG-8 Gas Diesel, installed in 1948.

Running Costs Reduced

Acadia states their Worthington units are entirely satisfactory. In particular, the Gas Diesel is outstanding for its amazingly economical use of fuel. Chief Engineer J. W. Embry submits the following figures, checked over a 24-hour period:

WORTHINGTON DDPG-8—Pumped 96,408,000 gallons. Gas fuel cost cut to less than half.

Besides fuel savings Worthington owners report substantial reductions in lubrication costs and maintenance labor. There's a Worthington Diesel that will bring *you* these advantages — for many years to come. For further facts proving *there's more worth in Worthington*, write to *Worthington Pump and Machinery Corporation, Engine Division, Buffalo, N. Y.*

WORTHINGTON

made by

American Bosch

Wherever Diesels take the incredible punishment of heavy earth-moving and excavating operations — you're almost sure to find American Bosch fuel injection equipment performing its exacting work. For years, American Bosch has been outstanding in this field. Construction men know from experience they can rely on American Bosch equipment for real performance and dependability. Diesel engine builders know they can count on American Bosch for competent engineering and precision production.

American Bosch Corporation, Springfield 7, Mass. • Service the World Over

Two of the Finest

for the Fastest

POWERED by a pair of General Motors Diesel engines, the Sohio Cleveland and its three integrated barges are expected to be the most efficient high-speed petroleum-carrying fleet on our inland waterways.

Naturally, you'll find towboat builders and operators, everywhere, swinging to GM Diesel engines—*they're the modern power plants that pay their way!*

Leader in Diesel engineering development for 37 years

CLEVELAND DIESEL ENGINE DIVISION

CLEVELAND 11, OHIO

GENERAL MOTORS

New pride of the Sohio Fleet—the Sohio Cleveland—a streamlined 150-footer and three integrated barges, built by the St. Louis Shipbuilding and Steel Co., powered by two General Motors model 16-278A Diesel engines.

GM GENERAL MOTORS DIESEL POWER

ENGINES FROM 150 TO 2000 H. P.

SALES AND SERVICE REPRESENTATIVES

NEW YORK, N. Y.
Cleveland Diesel Eng. Div.
General Motors Corp.
10 East 40th Street
New York 16, N. Y.

WASHINGTON, D. C.
Cleveland Diesel Eng. Div.
General Motors Corp.
504 Hill Building
Washington 6, D. C.

CAMBRIDGE, MASS.
Walter H. Moreton Corp.
9 Commercial Avenue
Cambridge 41, Mass.

NORFOLK, VA.
Curtis Marine Co., Inc.
548 Front Street
Norfolk 7, Va.

JACKSONVILLE, FLA.
Florida Diesel Eng. Sales
General Motors Corp.
332 E. Bay Street
Jacksonville 2, Fla.

TAMPA, FLA.
General Eng. & Equip. Co.
103 N. Franklin Street
Tampa, Fla.

ORANGE, TEXAS
Cleveland Diesel Eng. Div.
General Motors Corp.
212 First Street
Orange, Texas

LIVERPOOL, NOVA SCOTIA
Thompson Bros. Machinery Co., Ltd.
Liverpool, Nova Scotia

MIAMI, FLA.
Cleveland Diesel Eng. Div.
General Motors Corp.
2315 North West 14th Street
Miami, Fla.

NEW ORLEANS, LA.
Cleveland Diesel Eng. Div.
General Motors Corp.
831 Howard Avenue
New Orleans 13, La.

SEATTLE, WASH.
Evans Engine and Equip. Co.
1230 Westlake, North
Seattle 9, Wash.

VANCOUVER, B. C.
Hoffars, Limited
1790 Georgia St., West
Vancouver, B. C.

SAN FRANCISCO, CALIF.
Cleveland Diesel Eng. Div.
General Motors Corp.
445 Harrison Street
San Francisco 5, Calif.

...it's TRI-CLAD

NOW Tri-Clad construction features have been extended to include high-speed synchronous generators. This means

1 Greater Operating Dependability

2 Longer Generator Life

3 Reduced Maintenance Costs

These "900" series synchronous generators are rated 12½ to 1250 kva at 60 cycles, 514 to 1800 rpm. They give you

EXTRA PROTECTION
from physical damage

Rigid frames and end shields resist corrosion, protect the generator from dripping liquids, falling objects, and accidental blows.

EXTRA PROTECTION
from electrical breakdown

Proved synthetic insulating materials on random-wound coils give you resistance to mechanical abrasion, heat aging, and solvents. Resin insulating varnishes provide greater life in form-wound coils.

EXTRA PROTECTION
from operating wear and tear

Redesigned bearings, completely enclosed in cast iron, insure long life, more dependable service. New conduit box can be turned in any one of four directions, vastly simplified connections.

Modifications to fit all installation problems are available with belt-driven or direct-connected exciters.

Contact your nearest G-E sales representative for more information. He can give you ratings, modifications and shipment schedules. You can also avail yourself of application advice by experts who know your problems.

BE SURE OF THE BEST

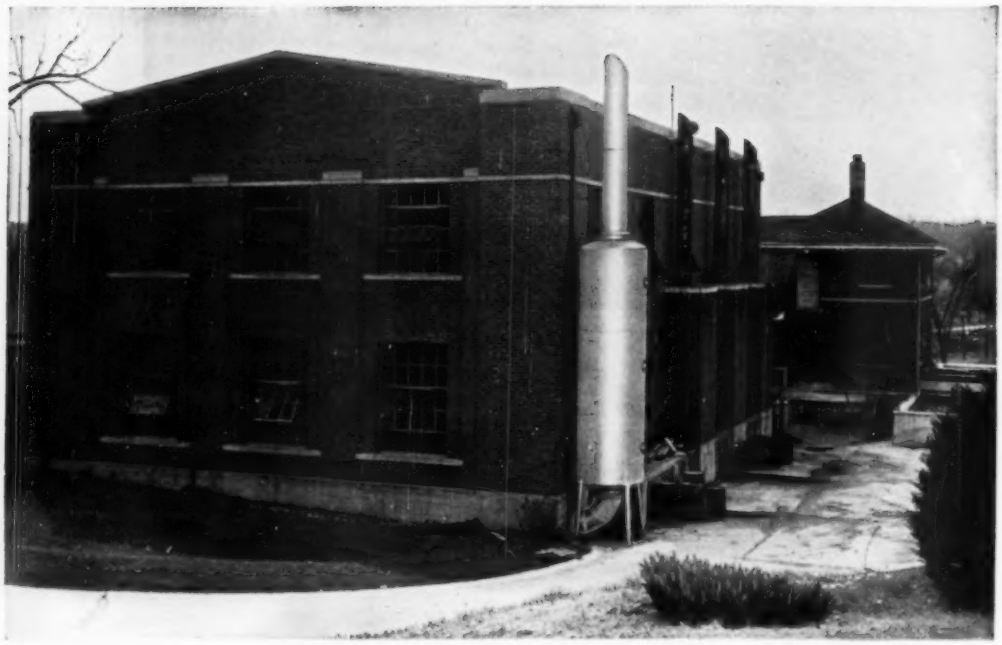
Specify Tri-Clad construction in your next generator. Apparatus Dept., General Electric Co., Schenectady 5, New York.

General Electric Co.
Apparatus Dept. Section B770-14
Schenectady 5, New York

I am interested in your Tri-Clad generators.

☐ Please arrange to have a salesman call on me.
☐ Please send me descriptive bulletin GEA-5125 on Synchronous Generators.

Name .....
Company .....
Address ..... State .....
City .....



Trenton, Missouri, Power Plant equipped with Burgess-Manning Snubbers.

Snub the Slug-and Stop the Noise

FROM ENGINE EXHAUSTS

Diesel and other internal combustion engines can be operated anywhere . . . without exhaust noise . . . when you equip them with Burgess-Manning Exhaust Snubbers. Widely used for such critical locations as office buildings, hospitals, community installations, ships, oil fields, and industrial applications where no exhaust noise disturbances can be tolerated or where danger of explosions or flying sparks must be eliminated.

Burgess-Manning Snubbers prevent noise by dissipating the "slugs" of gas from engine exhausts . . . with no interference to high engine performance. Special "Fog-jet" Snubbers snub the "slugs" to prevent exhaust noise, scrub out glowing sparks, spray a mist of cooling water vapor on the exhaust gases entering the Snubber . . . to cool and extinguish flame from the engine.

Burgess-Manning Snubbers are designed for Diesel, gas, dual fuel, and gasoline engines used in stationary, marine, locomotive, and portable service. A wide variety of types and sizes of Snubbers are available.

If you are considering the installation of Diesel or other type internal combustion engines, or if you have existing mechanical problems in exhaust systems, or noise complaints, let Burgess-Manning submit Snubber recommendations. Long experience guarantees satisfaction. Write for literature.

South Norwalk Electric Plant is equipped with Burgess-Manning Standard Industrial Exhaust Snubbers.

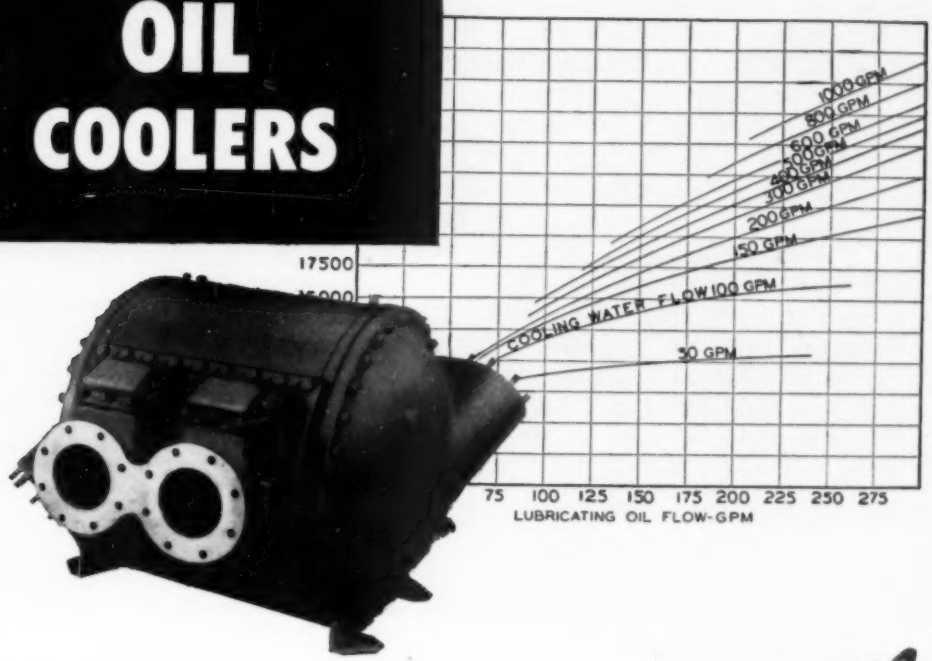
Oil-well servicing truck fitted with a Burgess-Manning Spark Arrester-Snubber.

Tuna purse seiner, "Santa Helena," uses Burgess-Manning SDM Marine Spark Arrester-Snubbers.

BURGESS-MANNING COMPANY

LIBERTYVILLE • ILLINOIS

HARRISON OIL COOLERS



Diesel engine manufacturers take advantage of Harrison's

COMPLETE TESTING LABORATORIES

to get the most efficient cooling unit for every Diesel engine application

HARRISON

HARRISON RADIATOR DIVISION, GENERAL MOTORS CORPORATION, LOCKPORT, N. Y.

7 Years 66,500 Engine Hours Compressor Service FLAWLESS

In engineering and constructing its $300,000 municipal power plant, this midwestern city selected the most efficient and long-wearing equipment available. Power units are three Diesels, rated at 730 h.p. each. Engines are started with compressed air, and all starting air is supplied by a single Gardner-Denver ADD Compressor. During seven years' operation, *"there has always been air at 250 lbs. pressure in the air tanks to start the engines."*

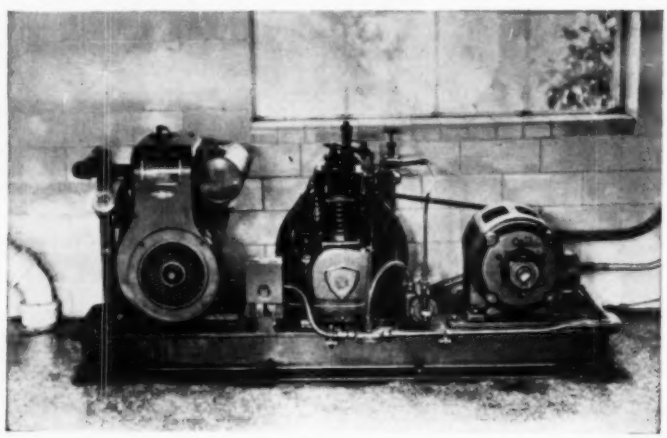
...writes superintendent of $300,000 power plant!

In this $300,000 municipal light and power plant at Osage, Iowa, complete dependence for all starting air is placed on a *single* Gardner-Denver ADD Compressor.

"The 2,190 h.p. plant was put into service in March, 1942," the superintendent reports, "and since that date has rolled up more than 66,500 engine hours of operation. Engines have been started thousands of times. In all that time, compressor service has been flawless, and there has always been air at 250 lbs. pressure in the air tanks to start the engines."

Dependable performance like this is what makes Gardner-Denver ADD Compressors a favorite for Diesel engine starting in all types of installations. Backed by 90 years of manufacturing experience, Gardner-Denver ADD Compressors are designed for long years of trouble-free service, with such important features as:

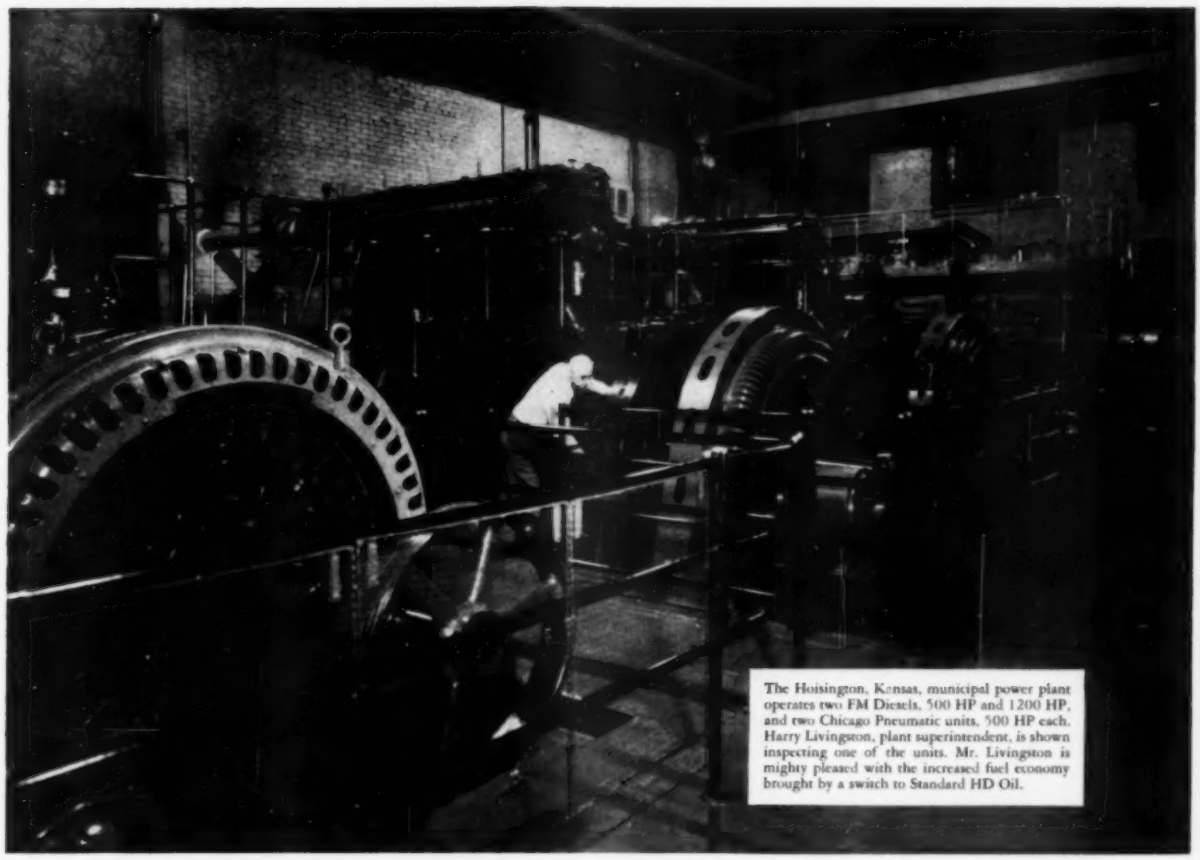
- √ **Drop-forged crankshaft, counterbalanced for smooth running.**
- √ **Timken tapered roller main bearings for reduced friction.**
- √ **Splash lubrication system for positive lubrication.**
- √ **Quiet plate type valves accessible in individual pockets.**



Since March, 1942, complete dependence for all starting air has been placed on this Gardner-Denver ADD Compressor. For normal operation, compressor is driven through V-belts by electric motor. In an emergency, with all engines shut down, belts are quickly switched to the sheave of gasoline engine mounted on the same base. *"This compressor is used every day and has been in operation for seven years—never causing us any kind of trouble in any way."*

For complete information on Gardner-Denver Compressors for Diesel engine starting, write Gardner-Denver Company, Quincy, Illinois.

GARDNER-DENVER
SINCE 1859



The Hoisington, Kansas, municipal power plant operates two FM Diesels, 500 HP and 1200 HP, and two Chicago Pneumatic units, 500 HP each. Harry Livingston, plant superintendent, is shown inspecting one of the units. Mr. Livingston is mighty pleased with the increased fuel economy brought by a switch to Standard HD Oil.

Gets greater fuel economy...

THE DIESELS at the Hoisington, Kansas, municipal power plant were put in operation in 1938 on straight mineral oil lubrication. As the load increased, carbon and varnish deposits showed up in the engines.

Operators took the advice of a Standard Oil Lubrication Engineer. They shifted the Diesels to a superior heavy-duty lubricant – Standard HD Oil.

No mechanical changes were made. Standard HD Oil alone solved the problem... and then some! Deposit troubles were completely eliminated. Operators reported an increase in power output of nearly *one kilowatt-hour* for each gallon of fuel oil used.

This increase in engine efficiency officials attributed to cleaner and more effective lubrication by Standard HD Oil.

STANDARD HD OIL

That's your clue to more economical Diesel operation! Shift to Standard HD Oil and get the benefits that this superior lubricant has proved it can give.

If your plant is located in the Midwest, write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, to secure the services of the Standard Oil Lubrication Engineer nearest you.

STANDARD OIL COMPANY (INDIANA) STANDARD

THE GENERAL MOTORS F7

A great new contribution to freight progress

SINCE 1940, when Electro-Motive pioneered the first Diesel road freight, the ability of General Motors locomotives to do *more* work *faster* and at *lower cost* has been fully demonstrated in the handling of more than 800 billion gross ton-miles of freight.

Out of this broad experience has come a new and even greater locomotive — the General Motors F7 — worthy successor to the far-famed F3 series of freight and heavy-duty passenger locomotives.

The F7 offers railroads all the proved advantages of Electro-Motive design plus a vast accumulation of new and advanced features. Traction motors have been redesigned for greater capacity and longer life. A new fuel injector has been developed to permit use of lower cetane fuel. Dynamic braking capacity has been increased. Engine-room ventilation has been improved, boiler water piping rearranged and more efficient steam generators made available to improve cold-weather operation.

These are just a few of the high lights. Many of these developments have been in regular production for months. Many more are now incorporated.

It is in a spirit of worth-while accomplishment that Electro-Motive presents the F7 — a locomotive which will achieve new levels of performance in both freight and passenger service, and with even greater savings than have been credited to General Motors locomotives heretofore.

In freight service the new F7 will haul 25% more tonnage on a 1% grade at continuous ratings and up to 33% more tonnage at short-time ratings for two hours. And it offers many other features which add up to improved freight service.

IMPROVED TRACTION MOTOR ***Greater Capacity—Longer Life*** Increased tonnage ratings are achieved by heavier power cable and the new Electro-Motive-developed traction motor which features inorganic insulation and more effective cooling. This permits an increase in traction motor ratings of as much as 25% with no increase in temperature rise and with substantial increase in motor life.

AUTOMATIC TRANSITION STANDARD

To avoid the possibility of operating errors causing damage to traction motors and generators, Automatic Transition is provided as *standard equipment* on the F7. Where manual operation is desirable, controls are so designed that the automatic circuits can be cut out.

INCREASED DYNAMIC BRAKING

Increased traction motor capacity is utilized to produce a 23% increase in dynamic braking energy which permits control of heavier tonnage.

BROADER FUEL RANGE

The new Electro-Motive fuel injector operates on fuel of 40 cetane rating with less combustion shock and lower cylinder pressures than the old injector with a 55 cetane fuel. Result — broader fuel range and in some cases lower fuel costs.

LOWER MAINTENANCE COSTS

A number of improvements in the F7 provide for greatly simplified maintenance, lower repair costs and longer, trouble-free life. Among others, they include:

INORGANIC insulation in traction motor armature and field coil is not subject to shrinkage or burning, thereby assuring longer life.

Powered by the time-proved, 16-cylinder 567 series General Motors two-cycle Diesel engine, the F7 has a power range from 1500 horsepower for a single unit up to 6000 horsepower for four units.

Complete separation of engine-room air from engine and dynamic brake-cooling air, and 100% filtration of engine-room air guards against the entrance of dirt and snow.

Recirculation of main generator air and closing off of discharge through underframe also helps to keep out dirt and snow, and will raise engine-room temperature during winter operation.

New dynamic brake-cooling design in which a single DC motor and a fan similar to the new engine-cooling fan replaces four blowers.

Improved arrangement of air-brake equipment for easier, quicker accessibility.

Improved intercooling and filtering of compressed air lessens chance of air-line freeze-ups.

All of these improvements — plus increased water supply and reserve steam generator capacity — are included in the new FP7-A for heavy-duty passenger service.

ELECTRO-MOTIVE

GENERAL MOTORS LOCOMOTIVES

DIVISION OF GENERAL MOTORS • LA GRANGE, ILL.

Home of the Diesel Locomotive

America's Biggest Diesels use . . .

KOPPERS

PISTON RINGS

MEXICO CITY licked a serious power shortage with the largest Diesels ever built in the Western Hemisphere. When Nordberg built these giants, Koppers Piston Rings were installed to insure the engines delivering top power. Again leading Diesel engineers had turned to Koppers Piston Rings for dependability on a tough job. There's a good reason! Koppers Piston Rings have set new records for dependability—and for economy—in airliners, Diesel locomotives, ocean-going tugs . . . in every kind of service on land and sea and in the air.

Behind the spectacular performance of Koppers American Hammered Piston Rings is the brilliant engineering that developed Porous Chrome* plating, K-Spun metal and other outstanding ring improvements. That is why engine builders and operators specify Koppers Piston Rings with confidence.

Take the first step to longer ring life and better engine performance—check with Koppers engineers.

Koppers Company, Inc., Piston Ring Department,
Box 626, Baltimore 3, Maryland.

*VAN DER HORST PROCESS

HOW POROUS CHROME RINGS WILL HELP THESE DIESELS

1. All rings seat immediately without scuffing and scoring.
2. Ring and cylinder wear greatly reduced. Result—longer operation at high efficiency.

NO CHANCES TAKEN!

IN INSTALLING GIANT DIESELS

KOPPERS

American Hammered

KOPPERS PISTON RINGS

Your Best Buy FOR POWER PERFORMANCE PRODUCTION

Mighty master of power problems for industry is the International UD-24 diesel power unit. It takes on heavy powering jobs with 180 *working* horsepower at 1375 r.p.m. and automatically delivers a reserve of engine torque when overloads demand it.

The International UD-24 diesel is rugged and ready for thousands of hours of hard work. It is the largest power unit in the dependable line of 6 diesel and 5 gasoline-type engines ranging from the 16 horsepower U-1 to this great 180-horsepower leader. Like hundreds of highly satisfied owners, you too will find International engines your best buy for power, performance and production.

Bring your power problems to your International Power Unit Dealer and get a quick and satisfactory answer to your requirements. Find out why your every power need—from running mills to driving generators—is best served by the right size of International Power Unit.

INTERNATIONAL HARVESTER COMPANY
Chicago

Send for our catalog describing the full line of International Diesels (39 to 180 horsepower) or the catalog on gasoline-type engines (16 to 55 horsepower). A folder: "Profitable Power" is also available upon request.

CRAWLER TRACTORS
WHEEL TRACTORS
DIESEL ENGINES
POWER UNITS

INTERNATIONAL INDUSTRIAL POWER

THE basic ingredients going into your orders for diesel crankshafts, drive shafts, and connecting rods, or steel castings are constantly under the watchful eyes of intelligent and experienced metallurgists, engineers and craftsmen. Each production operation is originated, supervised and completely finished within our plant here at Erie Forge Company.

What are the results? Finished products upon which you can fully depend to do their work like the thorobreds they are. More than merely meeting specifications, Erie Forge Products set the pace for excellence of performance in service . . . for profitable returns on your investment. Let us consult with you . . . each of us will profit.

ERIE FORGE COMPANY, ERIE, PA.

15 minutes

CLEANING TIME

FOR THE

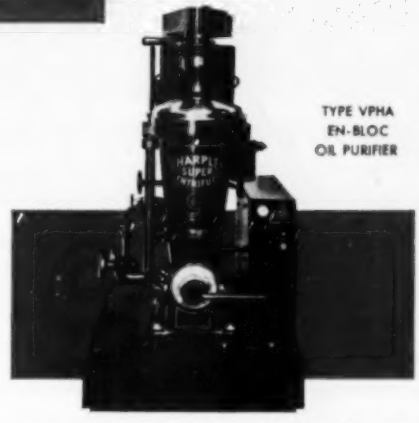
SHARPLES OIL PURIFIER

It's that quick . . . 15 minutes or less to remove, clean and replace the bowl assembly of a Sharples Oil Purifier. The assembly consists of three parts, a bowl, three wing and cap which altogether weighs less than 40 pounds. Being light enough for a man to lift, no chain hoist or other lifting device is necessary. Because it is equipped with brakes, the centrifuge can be stopped in one minute and it takes only an additional minute to reach full operating speed after restarting. It is important to note, that if a spare rotor is on hand the entire operation can be accomplished in less than 5 minutes.

Each Sharples Centrifugal Oil Purifier is supplied with a special bench and three wing puller tool so that disassembly can be accomplished speedily and with the least amount of effort.

This fast cleaning time is one of the most valuable features of Sharples Oil Purifiers because it means less down time, low labor and maintenance costs.

● *Sharples Engineers will be glad to cooperate with you in solving any of your problems concerning the purification of fuel or lubricating oils.*



TYPE VPHA
EN-BLOC
OIL PURIFIER

Specify Sharples Oil Purifiers for more efficient Diesel and turbine operation

Write for Bulletin No. A1250 which fully describes the application and specifications of the Sharples Oil Purifier.

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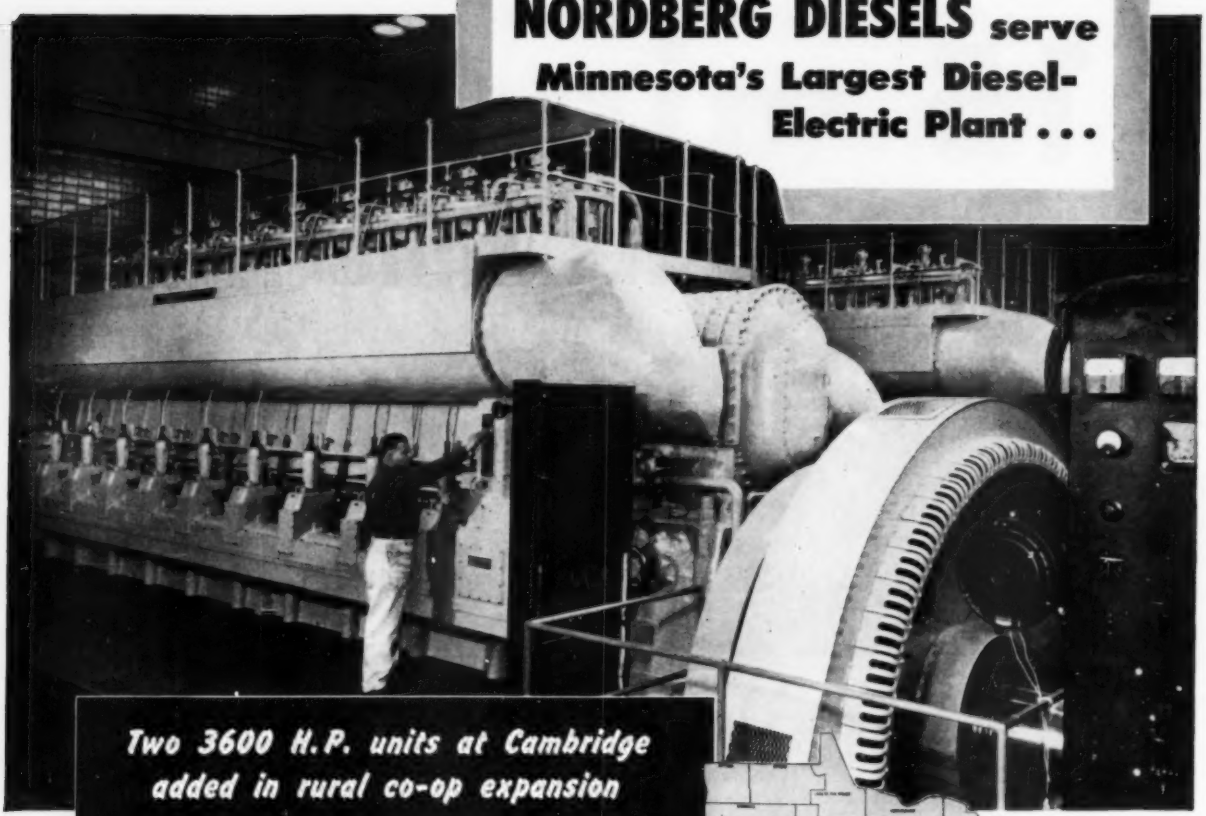
NORDBERG DIESELS serve Minnesota's Largest Diesel-Electric Plant . . .



Two 3600 H.P. units at Cambridge added in rural co-op expansion

UP in the east-central section of Minnesota, several local co-operative power associations have joined forces to provide electric power for some 22,000 customers. Upon completion of their current expansion program, consumer capacity will be nearly doubled.

Part of this expansion centers around the generating station at Cambridge, where two new Nordberg Diesels were recently installed. Started in 1945 with one 1125 K.W. unit, this plant has increased its capacity twice. The latest addition of two 3600 H.P. Nordberg Diesels now brings the total capacity up to 7250 K.W. — making the Cambridge plant the largest Diesel installation in Minnesota.

The advantages of dependable, low cost, long life service built into every Nordberg Diesel, Gas and Duafuel Engine make these rugged units a leading choice for every power need — in sizes from 10 to 8500 H.P. Write for further details, outlining your requirements.

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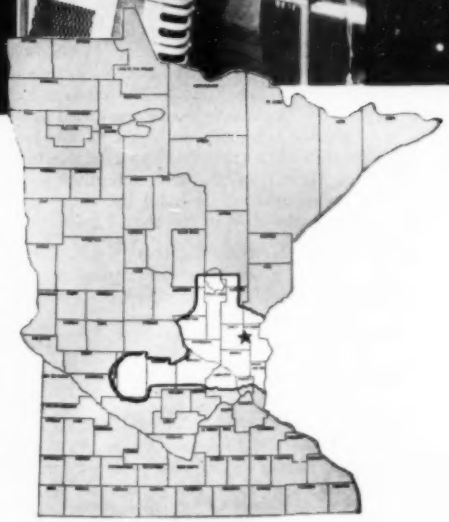

Map shows outside boundaries of the several Minnesota co-operatives being served from the main Generating Co-Op.
★ Indicates location of Cambridge plant.

P1149

NORDBERG
DIESEL ENGINES

DIESEL and GAS ENGINE PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

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Member National Business Publications, Inc. and Controlled Circulation Audit, Inc.

CONTENTS FOR NOVEMBER, 1949

DIESEL PROGRESS for Nov. 1949, Vol. XV, No. 11. Published monthly by Diesel Engines, Inc., 2 West 45th Street, New York 19, N. Y. Tel. MUrray Hill 2-7333. Subscription rates are $5.00 for U.S.A. and possessions. All other countries $7.50 per year. Subscriptions may be paid the London office at £2-12s-6d per year.

DIESEL PROGRESS is indexed regularly by Engineering Index, Inc.

FRONT COVER ILLUSTRATION:

Big scale strip mining in West Virginia with an International tractor-bulldozer.

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MUNICIPAL DIESELS IN GOSHEN, INDIANA

By F. H. N. CARTER

GOSHEN, Indiana, September 27, 1949. Here in the flourishing farm country of Indiana, the enviable record of fifty-seven years of public service has been set by the City Light and Water Works. Starting in 1892 with a small steam-driven generating set, the demand for power soon superseded the supply and additional current was purchased from the Interstate Power Company of Indiana.

Then known as the Citizens' Electrical Company, it continued to purchase current from the same source until the year 1931. In 1930, the Interstate Power Company had purchased another supplier of electrical power, the Hawks Electrical Company and traded it to the Northern Indiana Public Service Company which in turn took over furnishing the supplementary power requirements of the Citizens' Electrical Company in Goshen.

The latter then decided to generate more of its own power requirements, acquired four large diesel generator sets, changed its name to the City Light and Water Works, and put the new plant into operation in July 1931.

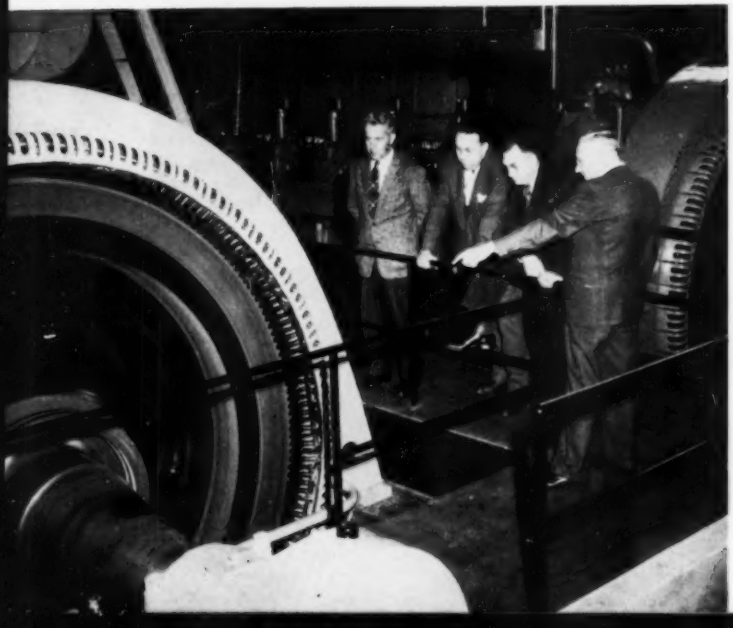
With ever-expanding requirements, it was again found necessary to purchase current from the Northern Indiana Public Service Company from May 3, 1943 under a contract expiring September 30, 1949. With the recent placing in service of two new diesel-generator sets, this progressive municipal power plant now has completely adequate facilities for generating power.

Mr. Merle J. Miller, Superintendent of Utilities, who conducted us on a complete plant inspection tour, joined the municipal plant in 1916 and worked in the Water Department. In charge of outside electrical distribution in 1918, in 1920 he became assistant to the plant manager, in 1929 General Superintendent and from 1939 to 1940, he was also a member of the Utilities Board of the City of Goshen. Leaving in 1940, Mr. Miller returned in January 1948 to take up the post of Superintendent of Utilities.

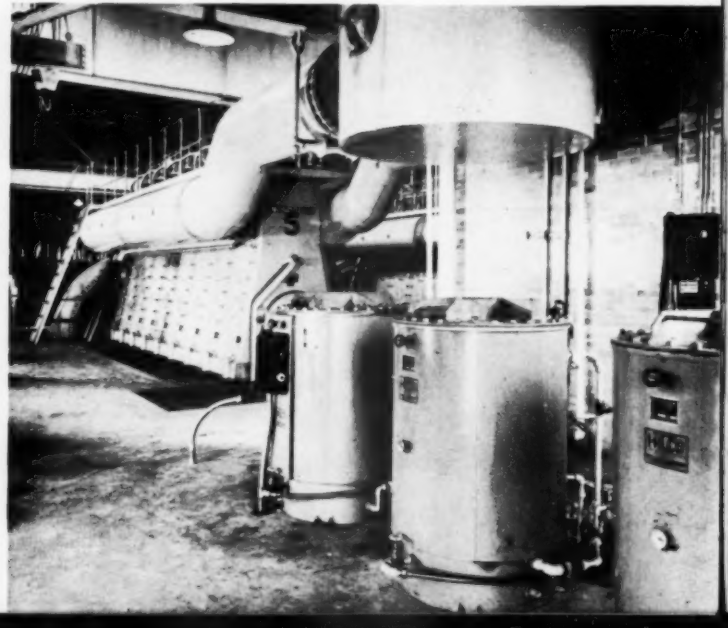
The plant is conveniently placed alongside the main east-west railroad tracks of the New York Central. Fuel and lubricating oils can therefore be received by either road or rail. The fuel oil storage has an ample capacity of 320,000 gallons distributed in three 20,000 gallons horizontal, two 100,000 gallon vertical and one 60,000 gallon vertical, outside steel tanks. The lubricating oil is stored in one underground steel tank of 10,000 gallons capacity.

The fuel oil storage tanks are equipped with heating coils. The source of heat is an ingenious

The Board of Public Works and Safety of the City of Goshen discuss one of the generators with the Superintendent of Utilities. From left to right, Messrs. Carl A. Cozzi and Robert B. Hartzog, Mayor Rolin R. Roth and Superintendent Merle J. Miller.



In the foreground, three of the four Hilco oil filters. Two are electrically operated and two steam. In the background, the two Nordberg diesels direct coupled to Elliott generators.



arrangement of coils—"waste heat boilers"—in the diesel engine exhaust snubbers.

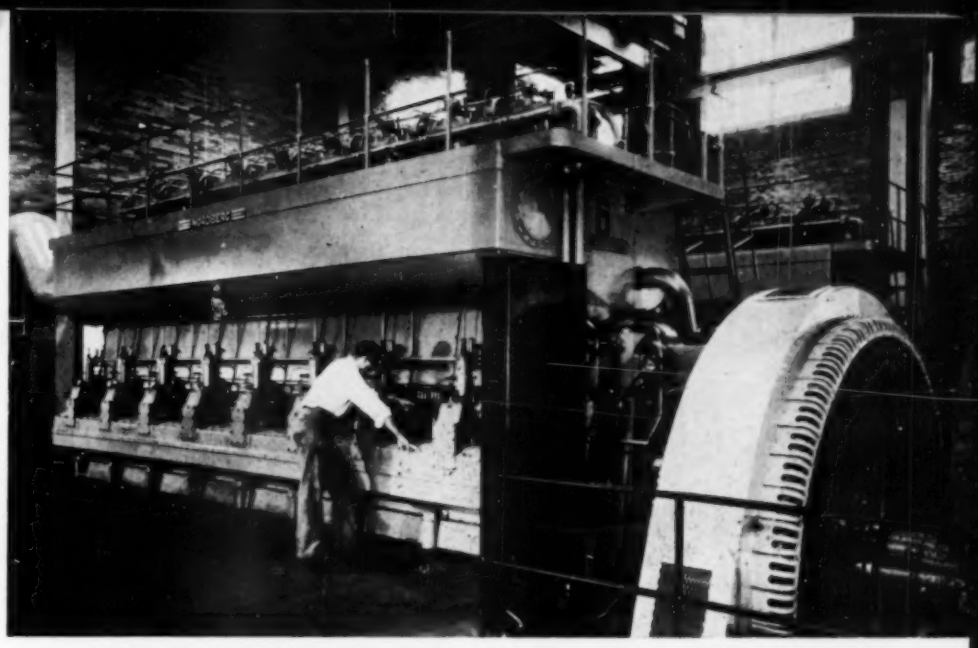
The engine room presents an imposing appearance with its four original diesel-generators in line and the new raised wing with its two new generator sets at right angles to the rest of the installation. The former, which are still giving good and reliable service, are as follows: three six cylinder 900-hp., 620 kw., at 80 per cent pf., diesel-generators and one 1400-hp., 1000 kw., at 80 per cent pf.

The two new units showing up to great advantage against the gleaming tiles of the recently constructed wing, are eight cylinder, two cycle, mechanical injection, 21½ inch bore, 29 inch stroke diesels rated 3200-hp. at 225 rpm. Each engine is direct coupled to a 3125-kva, 2500-kw, 2400/4160-volt, 50 C rise, 3 phase, 60 cycle, 80 per cent pf., generator. The two exciters are 40-kw 1150-rpm., 125-volt, 40 C rise.

250 hp. is required for each of the squirrel cage, induction motors which drive the two scavenging blowers. These centrifugal blowers each deliver 15,000 cubic feet of air per minute at 60°F and 3550 rpm.; inlet pressure 14.3 psia and discharge pressure, 2.75 psig.

Each cylinder of the diesels has its own camshaft driven fuel pump. Governor controlled, they bypass automatically any excess fuel. Lubrication and piston cooling are accomplished by a pressure circulating system delivering oil to all bearings and working parts of the engine.

Power cylinder lubrication is accomplished by multi-feed timed lubricators which supply oil at several points on the periphery of the liners. Lubricators, one for each cylinder with a separate pump for each feed, are timed to deliver lubricating oil to the piston when it has reached a predetermined position in the cylinder.



Chief Engineer E. A. Dillenback inspects one of the lubricators on one of the Nordberg engines.

The lubricating oil is filtered through four high capacity units, two of which are steam heated and two electrically heated.

Two new air compressors supply starting air for the two latest additions to the Goshen plant.

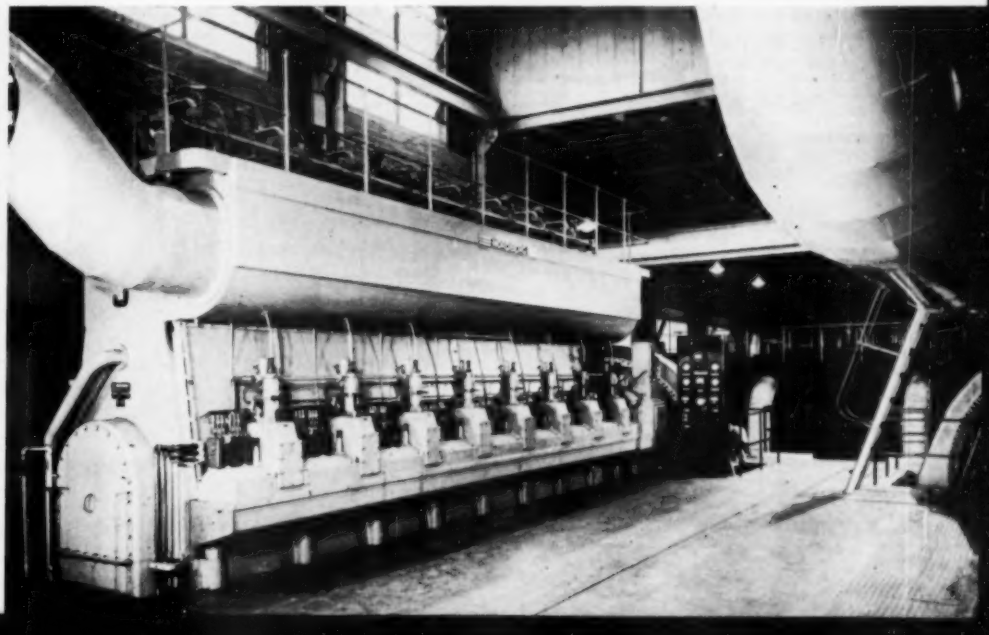
The spacious basement contains the two large tubular oil coolers, two centrifuges which can be used for either fuel or lubricating oil, oil meters, fuel oil unloading and transfer pumps, raw and jacket water pumps and the starting air compressors. The scavenging blowers are housed in a separate annex to the building. On the outside of the building can be seen the exhaust snubbers and air intake silencers.

Temperature control of engine jacket water is obtained by means of a 2,700 gpm., cooling tower situated outside and to the rear of the main plant building. With a specified cooling range of 15°F. the water to the tower has a temperature of 104°F., which is cooled to 89°F.

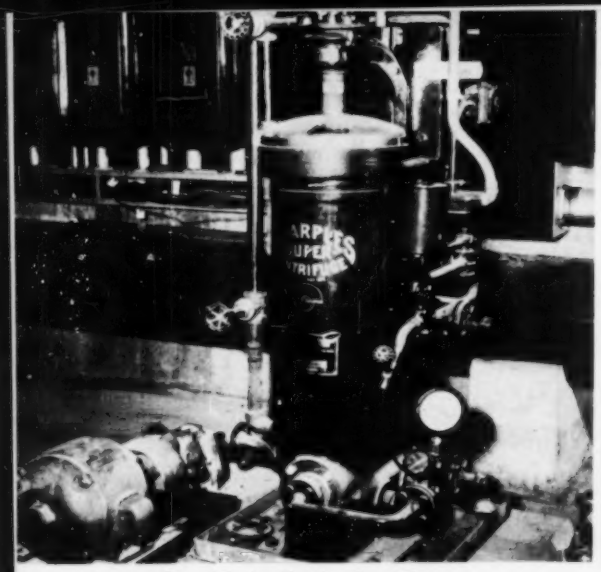
These two new diesel-generators and the necessary building modifications and other plant facilities represent a large investment for a city the size of Goshen. Through the courtesy of Mayor Rolin R. Roth, Mr. Carl A. Cozzi and Mr. Robert B. Hartzog, who constitute the Board of Public Works and Safety controlling all utilities, we were allowed access to financial statements and reports which were explained fully by Mr. William S. Hart, City Auditor and Mr. Clare F. Garber, City Clerk-Treasurer.

The new plant and alterations entailed an expenditure of approximately $1,000,000 which was

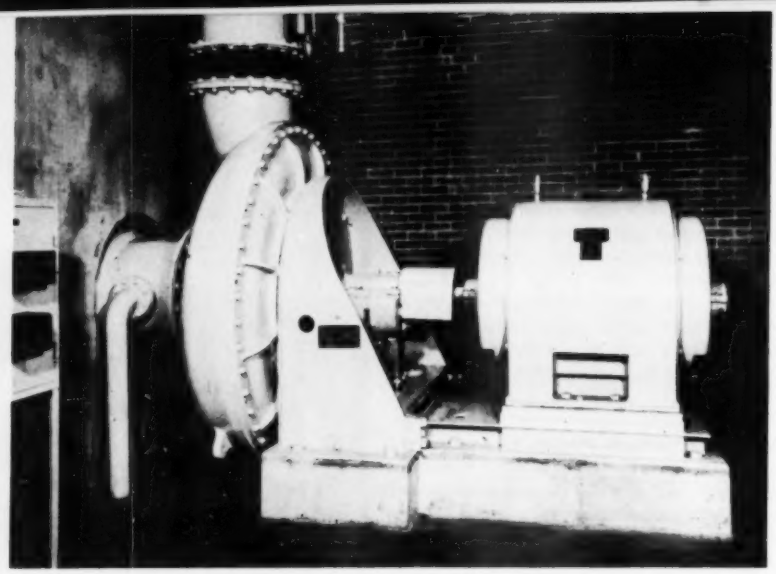
Chief Engineer Dillenbeck and Superintendent Miller discuss test run figures. In the backgrouna can be seen one of the Woodward governors and a Bosch fuel pump.



Looking down to wide aisle between the two engines. Control panel of one diesel can be seen to the left and in the background are the four original diesel-generator sets.



One of the two Sharples oil centrifuges.



One of the two Elliott motor driven centrifugal scavenging blowers.

financed by a new bond issue of $600,000 at 2¼ per cent, 20 year maturity, the balance being provided from money on hand in the depreciation fund. With some 3,500 customers including a large number of well established local firms such as the Mogul Rubber Company, Barler Metal Company, Penn Electric Switch Company and many others, a steady and reliable income is assuring the financial security of the concern.

The following figures show the actual unit cost of electrical power produced at the Goshen plant in August 1949 which was of course, prior to the utilization of the two new units which, ordered in 1947, were put on load after exhaustive tests in September of this year:

KWH generated:	784,600
Unit Costs:	
Superintendence:	.000255
Operating Labor:	.001666
Lube Oil:	.000041
Fuel Oil:	.008320
Operation Supplies and Expense:	.000505
Maintenance Labor:	.000142
Maintenance Plant & Equipment:	.000539
Total:	.011468

According to the authorities in Goshen, it is confidently expected that a considerable improvement will be shown on these figures when the new section of the plant has been fully operative for a reasonable length of time.

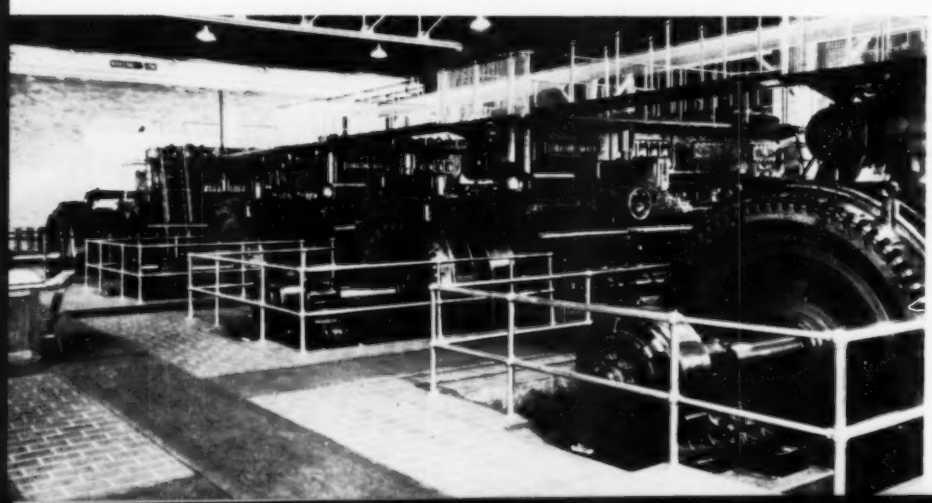
The following 1948 figures showing customer distribution, power consumed and income from the different groups, are also of interest:

Customer	KWH Sold	Dollars Received
Residential 3,096	5,423,357	$173,325.05
Commercial & Industrial, 412	6,152,057	139,039.02
Street Lighting (City)	605,400	16,345.80
Public Bldgs. 14	263,882	6,304.19
Int., City Dept. Sales	1,030,569	16,803.01
Misc., Sales		384.46
Totals.	13,474,305	$352,205.53

Mr. Miller is ably seconded in the running of the plant by Chief Engineer E. A. Dillenbeck. A policy of hiring high grade help is maintained and every effort is made by Mr. Miller to see that all of the men get a good training to enable them to be able to start and stop engines and take the correct measures in any possible plant emergency.

Fully equipped with alarm and safety systems, this power plant certainly rates with the highest in efficiency of operation as well as excellence of appearance. The City of Goshen is to be congratulated on its planning, financing and operation of this, the most recent diesel-generator addition to the vast number of diesel engined electrical plants in America.

The four original Fairbanks-Morse diesel-generators which are still in service at Goshen.



SOME OF THE EQUIPMENT AND SUPPLIERS

3200-hp. Diesels: Nordberg Manufacturing Co.
Air Filters: American Air Filter Company, Inc.
Fuel Injection Equipment: American Bosch Corp.
Lube Oil Pumps: Blackmer Pump Company
Air Intake Snubbers: Burgess-Manning Company
Exhaust Snubbers: Burgess-Manning Company
Blowers: Elliott Company
Generators and Exciters: Elliott Company
Fifteen ton engine room crane: W. R. Fithian Co.
Starting Air Compressors: Gardner-Denver Co.
Electrical Controls: General Electric Company
Storage Batteries: Gould Storage Battery Corp.
Lube Oil Filters: Hilliard Corporation
Pyrometer (Almor): Illinois Testing Laboratories
Pumps: Ingersoll-Rand Co.
Lubricators: Manzel, Inc.
Fuel Oil Meters: Neptune Meter Company
Cooling Tower: J. F. Pritchard & Company
Fuel Oil Preheaters: Ross Heater & Mfg. Co.
Centrifuges: Sharples Corporation
Fuel Oil: Shell Corporation
Lubricating Oil: Socony-Vacuum Oil Company
Lube Oil Coolers: Struthers Wells Corporation
Alarm System: Viking Instrument Company
Governor: Woodward Governor Company
Fuel Oil Transfer and Unloading Pumps: Worthington Pump & Machinery Corp.

PUMPING CITY WATER AT PONTIAC

By WILL H. FULLERTON

THE city of Pontiac, Michigan, is fortunate in having a plentiful supply of excellent water from a number of municipal wells several of which were only recently drilled.

The installation of three new combination diesel and electric pumps with a total capacity of 9,720,000 gallons a day, the enlarging of some water mains, and the erection of a new elevated storage tank are all steps towards the rehabilitation and extension of the city's Water Department facilities assuring a plentiful water supply for years to come.

The pumping units are characterized by extreme compactness and flexibility compared to the steam-driven pump which they replaced and which had been in continuous service since 1902. Previous to the new installation, Pontiac had two steam pumping units in the main pumping plant, one of 8,000,000 and one of 5,000,000 gallons daily capacity. The 8,000,000 gallon steam pump broke down recently and after a survey of replacement parts, costs and the condition of the aging steam boilers, it was decided to replace the broken steam unit with the diesel-and-electric pumps. The second steam pumping unit will eventually be replaced by similar equipment.

The three new pumps together weigh little more than one flywheel from the old unit. Each consists of a pump, an induction motor and a 6-cylinder diesel engine mounted in line on a structural steel base.

The 440-volt, 60 cycle motors are rated 125 hp at 1770 rpm full load. The diesels develop 135 continuous bhp at their governed full load speed of 1750 rpm. The engines have push-button electric (battery) starters and constitute a dependable independent power supply. The pumps are rated at 2250 gpm at 1750 rpm against the 160 foot head.

The three components of each new pumping unit (motor, pump and diesel engine) are connected by couplings each of which employs six solid rubber balls enclosed in a recessed casing as a resilient, replaceable and easily removed means of transferring power from the motor or engine to the pump. Only one of the couplings is in use at a time depending on whether the pump is driven by the motor or the engine, but a two minute shift is possible merely by switching the rubber balls from one coupling to the other. In this way, the couplings serve as a clutch or quickly-changed hook-up between the pump and the source of power thus eliminating considerably more expensive transmissions which were originally contemplated.

The units are 5 feet high, only 2 feet 8 inches wide and 15 feet long at the base. It was therefore a comparatively easy matter to skid each one into the existing pump station through the boiler-room doors.

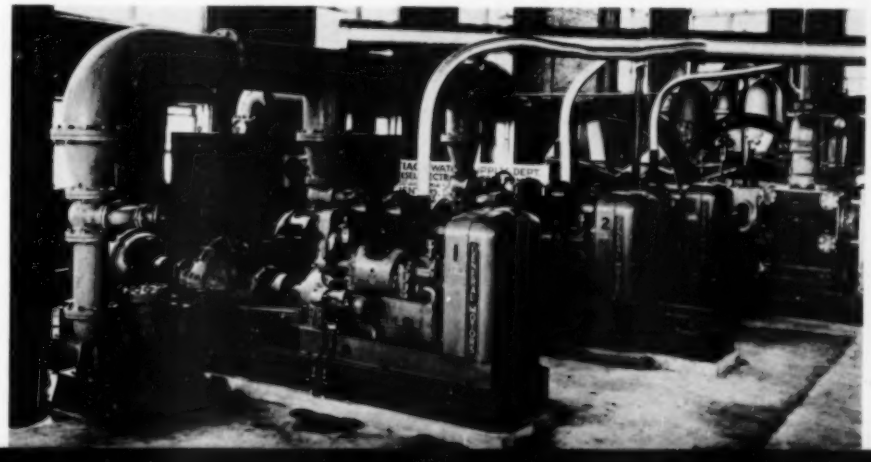
Lowering one of the units for installation.

Pontiac welcomed the delivery of these new pumping units by a public reception where they were displayed on the street for some time.

The diesel engines were supplied by Detroit Diesel Engine Division of General Motors Corporation; the motors were furnished by Westinghouse Electric and the pumps by Peerless Pump Division of Food Machinery and Chemical Corporation. The couplings mentioned are by Crocker-Wheeler Company.

The design, engineering and mounting of all elements on the bases was carried out by Earle Equipment Company of Detroit, G.M. diesel distributors.

"City Fathers" discuss the new installation. Left to right: Commissioner Benjamin Gates, Former Mayor Cowe, City Manager George E. Bean and Mayor J. H. Patrick Glynn.



Engine floor of the City of Pontiac Water Supply Department showing installation of three new diesel and electric pumping units with a combined capacity of nearly 10,000,000 gallons per day. Remaining steam pumping unit, capacity 5,000,000 gallons per day can be seen in the background.

200,000 ENGINE HOURS AT RED BUD

By WILLIAM H. GOTTLIEB

Municipal electric plant at Red Bud, Illinois.

RED BUD, Illinois, has one and a third diesel horsepower for every one of its 1400 inhabitants, and the power plant these people own has made some important contributions to their welfare. First, it has provided a high standard of service; in the last five years there has been but one interruption of power and that lasted just 3½ minutes. While keeping electric rates at or below levels prevailing in communities of similar size, the plant has made substantial cash payments to the town. This has meant public improvements and low taxes; yet at this writing the town is completely free of debt. Low industrial power rates together with unfailing service have attracted manufacturing plants that mean jobs to more than 100 men. To complete the record, the five diesels and all necessary equipment have not cost the town a dollar, for all current and capital expenses of the electric department are paid out of plant earnings.

Red Bud has owned and operated its own power system since 1907 when the town paid $8,750 for a little steam plant and distribution system which had been run under franchise since 1903. The first internal combustion engine was installed in 1924, a semi-diesel, followed in 1928 by a 240-hp., 4-cylinder unit which is still in service. These engines were leased from the manufacturer and the monthly payments of $410 applied to the purchase price. Next expansion came in 1936 with the installation of a 5-cylinder diesel rated at 375-hp. at 300 r.p.m.

Five years later a major improvement program was undertaken. The 1928 engine was modernized, the 1924 unit removed, and two new 225-hp., 3-cylinder diesels installed. The load, which had grown steadily, spurted during the war years and continued its rapid advance after the war. In 1944, the peak load was 250-kw. In 1948 the load had climbed to 700-kw. with the American Furnace Co. plant alone taking as much as 300-kw. Obviously additional generating capacity was needed badly, and consequently the city installed in 1948 a 7-cylinder, diesel rated at 805-hp. at 300 r.p.m.

Six slow-speed, heavy-duty engines (five of them still in service) have supplied all the town's needs for nearly 25 years with upward of 200,000 engine hours of operation. Clearly Red Bud is in a position to judge the durability and efficiency of its power equipment and to assess the contributions of the municipal utility to the community. The unfailing service of the plant, bolstered now by adequate reserve capacity, is important to the residential consumer in these days of electric appliances and frozen foods, but it is even more vital to industry. Originally a farming community in the heart of a rich agricultural region with a trading population of 6,000 Red Bud in recent years has sought to attract industry. American Furnace Co. found here the two essential elements of power supply: service and moderate rates. Even in this high-cost era, the company pays only 1.75 cents per kw. hr. for the bulk of its requirements. Utilizing reserve funds provided by power plant earnings, the city is glad to assist new industries in locating and constructing plants. Today, American Device Mfg. Co., two feed mills, a flour mill and a locker plant have joined Red Bud's growing list of industrial power users. The importance of this development to a town of 1400 people needs no further elucidation.

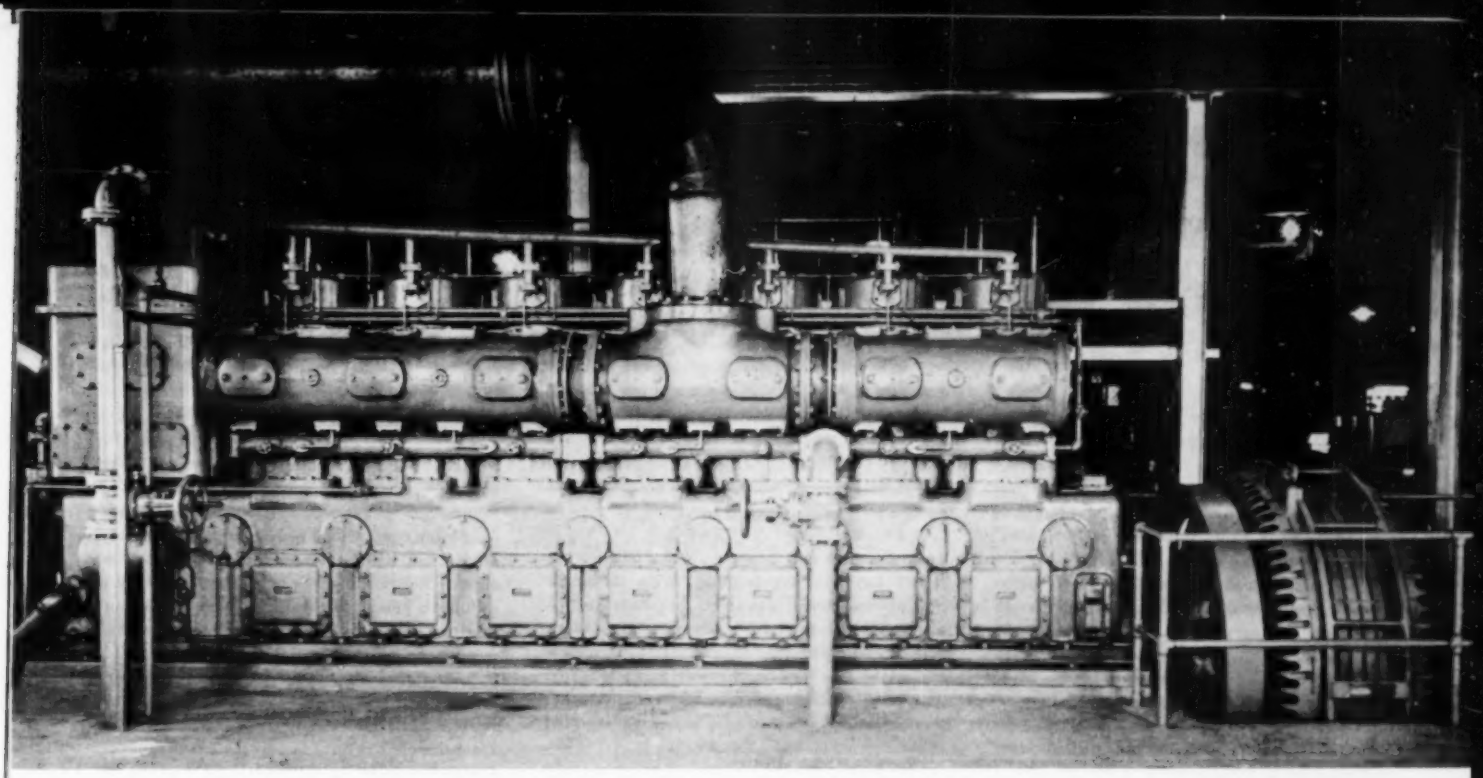
This progressive small town has a two-story brick civic center including council rooms, library, youth center, fire department, courtroom, and public assembly hall. Adjoining is a public park. A new high school on a 12-acre campus was completed recently at a cost of $150,000. There is a fine modern hospital. Streets are paved and well lighted. To all these public projects, the power plant has made some contribution. At the time of the latest addition to the power plant, all obligations due has been paid out of earnings and bonds due as late as 1951 had been called in advance. The remaining $15,000 in bonds were refunded and $104,000 in certificates of indebtedness issued for the building extension and new equipment. The terms of this financing specify that the certificates shall be a legal claim only on plant earnings.

The sound financial record of the power system has been possible only because of intelligent operation of efficient equipment. Even before the installation of the new engine, Red Bud's veteran diesels have produced close to 12-kw. hours per gal. of fuel consumed. In the last five years, the return has ranged from 11.86 to 12.06. Utilities Superintendent L. N. Snider hopes to improve on that record by careful attention to operating engine load factor. He plans to run the new engine at 80 percent or more of capacity. The variety of engine sizes available to the operator should permit an improving load factor for the entire plant.

A regular maintenance schedule is designed to keep the diesels in peak operating condition. Pistons are pulled once a year and a complete check is made of crankshaft alignment heads, connecting rod bearings, main bearings, pistons, rings, piston pins, exhaust ports, and air intake. In the past, engines have been found in excellent condition. Rarely is there a stuck ring, cylinder wear is small, and bearing wear negligible. After 24,000 hours, the 240-hp. engine showed maximum cylinder wear of just .007.

Protective accessories do their part in preserving engine efficiency. The Standard Oil high speed diesel fuel is trucked in and unloaded by a motor-driven centrifugal pump into two 12,000 storage tanks, from which it is pumped to individual elevated day tanks within the plant. In the case of the new engine, fuel is drawn from storage through a meter by a motor-driven gear pump, then put through a filter and up to an overhead day tank. There is also a pair of fuel filters on the engine.

Both Standard Nonpareil and Texaco Ursa lubricating oils are in use. No lube oil ever is discarded. For the four older engines, a batch purifier is used. For the new engine, with its pressure lubricating system, a filter is in continuous service. Both purification systems utilize activated clay elements. In the big engine, oil is used to cool the pistons and so the oil is put through coils in an evaporative cooler. The same cooler serves to keep cooling water at the desired temperature. The oil temperature regulates the unit's shutters. A thermostatically-controlled by-pass valve keeps engine jacket water at prescribed tem-



Latest of the five Fairbanks-Morse diesels installed at Red Bud.

perature. For the older engines, jacket water is circulated through the engines and a heat exchanger or coils in another evaporative cooler. An atmospheric-type cooling tower works in parallel with the cooler, handling raw water from the heat exchanger. All water is circulated by motor-driven centrifugal pumps, of which there are nine in the plant.

All intake air is filtered. Air from the big pump-scavenging engine is drawn through an air filter and an intake silencer mounted beside an exhaust silencer on a steel platform outside the plant. The new engine has a complete alarm panel with an Alnor pyrometer and pressure gauges on lube, water and scavenging air.

The nine-panel switchboard holds voltage regulators, engine-hour meters, circuit breakers, kw. hr. meters, and other instruments.

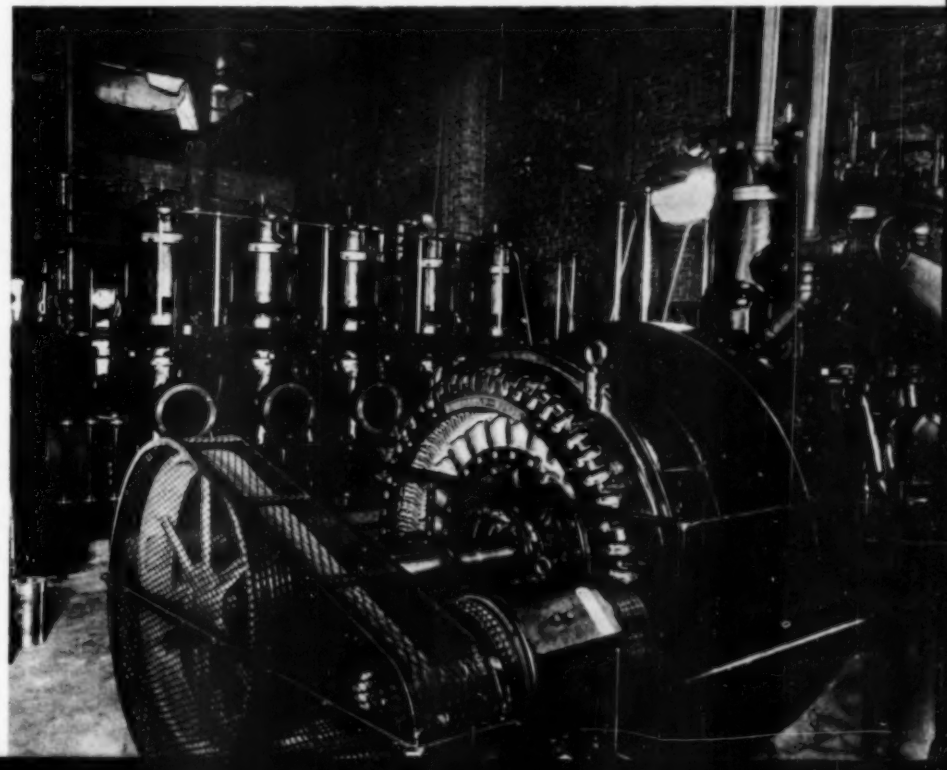
Superintendent Snider and his five-man staff handle an amazing amount of work. They operate the power plant, do all necessary maintenance, handle the distribution system, the waterworks and its distribution lines, the sewage disposal system, and even read meters. Yet, they manage to keep 8-hr. shifts, a 6-day week and a 10 day vacation each year. Snider, an electrical engineer, is not above climbing a pole when the need arises and was busily engaged in installing 40 capacitors on the distribution lines when the writer visited the plant.

Power policy at Red Bud is under the supervision of Mayor Paul Loesche and the six-man city council. With good diesel engines producing power for .015 at the peak of the inflationary period, the major problems have been disposal and allocation of profits.

SOME OF THE EQUIPMENT

Diesels and semi-diesels	Fairbanks-Morse
Centrifugal and gear pumps	Fairbanks-Morse
Fuel Filter	Hilco Hyflow
Fuel Filters (engine)	Nugent
Fuel Meter	Niagara
Lube Oil Batch Purifier	Youngstown-Miller
Lube Oil Filter	Hilco Hyflow
Evaporative Coolers	Fairbanks-Morse
Heat Exchanger	Schutte & Koerting
Air Filter	Duplex-American
Intake Silencer	Maxim
Exhaust Silencer	Maxim
Voltage Regulators	Westinghouse
Engine Hour Meters	Weston
KW Hour Meters	Duncan and G.E.

The older Fairbanks-Morse diesels at Red Bud.



TOWBOAT "ILLINI" INTRODUCES NEW IDEAS

By DOUGLAS SHEARING

RIVER men and others in marine circles will want to keep an eye on the *Illini*. Latest Mississippi system diesel towboat, it has just been completed for Illinois Farm Supply Company.

A triple-screw vessel, powered by three supercharged 6-cylinder diesels, the *Illini* follows the modern trend of great power in a compact boat by packing 2,200 horsepower into a hull only 115 feet long by 30 feet wide by 10 feet, 4 inches deep. But from this point on, the boat's distinctive features put it in a class by itself. How this came about is also rather unusual, and might best be touched upon at this point.

Realizing that it costs at least $1,000 a day to tie up a busy towboat for repair or maintenance, Illinois Farm Supply set out to obtain a boat as completely free from, or even immune to the common causes of tie-ups as experience and modern knowledge would permit. In addition, they wanted a fast, exceptionally maneuverable boat, particularly suitable for the pushing of petroleum products on the Mississippi system and the intercoastal canal. A normal tow will consist of four 9,000 barrel barges and two 12,000 barrel barges. It is expected that the boat will pick up oil products at four different points—Lake Charles and Destrehan on the canal; Baton Rouge, Louisiana; and Helena, Arkansas; delivering the tows to the company's bulk terminal at Kingston Mines, Illinois. Round trips, therefore, are to total as much as 3,500 miles.

In order to obtain maximum thrust for horsepower and to tow at over 8 mph loaded, the *Illini* was designed as a 3-screw boat. A full model bow also contributes to this speed.

As mentioned, the design and powering of the *Illini* was also influenced by the desire for extreme maneuverability. Aside from the maneuverability gained by 3-screw operation, 2 right-hand and one left-hand propellers, the boat has complete pilot house control and can be operated with only one engineer and one striker on a watch. However, there are quarters for 15 men.

An electrically controlled hydraulic steering system operates 4 backing rudders and 3 steering rudders. Unusual rudder power is evidenced by the fact that at full speed the rudders operate from hard over to hard over in about 11 seconds. As the *Illini* left Jeffersonville on her initial run April 28, it was quickly apparent that here was a vessel probably unequalled in maneuverability by any other river boat approaching her horsepower. Both Port Captain M. A. Huddleston and Pilot Joseph Hightower found the handling to be a novel and promising experience.

An unusual design feature of the hull is the *Illini's* fore and aft framing. With the main strength members running longitudinally, a stronger and stiffer hull is achieved. The hull is ⅜-inch plating throughout but with ½-inch plating at the bow and in the way of the tunnels. And, as a matter of personnel safety, the boat has a minimum freeboard of 24½ inches when loaded to the maximum draft.

Perhaps most unusual of all is the practical extent to which this vessel has been made immune to the need for repair or maintenance tie-ups—a matter of the most careful, detailed planning based on the 30-year experience of the builder and augmented by the help of the engine builder.

On conventional boats of the past, the fuel, lube and water pumps and air compressors are usually driven from the main engines. Failure, therefore, of any auxiliary unit often results in a complete shutdown. In order to minimize layovers, if not to avoid them entirely, the *Illini's* pumps and other auxiliaries are disconnected from the main engines, operating independently by electric motor drive. In addition, the functions of all operating equipment are protected by 100% standbys.

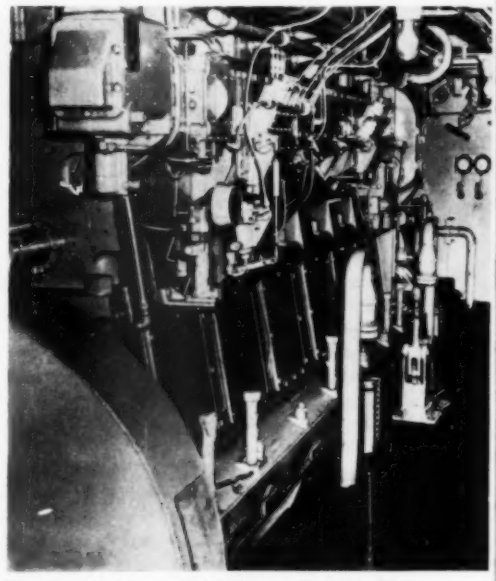
Power for ship's service and the driving of all auxiliaries is furnished by 3 30 kw A.C. diesel generating sets. The generators are arranged so that one will carry the normal daytime running load and two the night load. Thus one generating unit is always available for standby service. It is obvious from this that despite the failure of a generator or any auxiliary unit, this boat can be kept operating at full power. Furthermore, it will be possible for the crew to do downstream maintenance work on one main engine at a time, as two engines can provide the downstream speed normally desired.

The generating sets are continuous, self regulated units needing much less control equipment than would otherwise be required . . . and making them easier to parallel. Also important is the fact that this is an alternating current system (120/208 volts, 60 cycles) instead of the customary direct current. Since electrical equipment for A.C. service is much more readily available than for D.C. service, this is another distinct advantage.

In the *Illini's* engine room, the chief engineer has complete finger-tip control at one stand where any one piece of equipment can be started or stopped. A totally-enclosed switchboard of the dead-front type, with 3 generator panels and one distribution panel, has all the necessary instruments for paralleling any or all machines. It also includes a motorized electrical contractor for putting machines on the line and a remote control switch for regulating engine speed. Added to this is a shipyard-built control panel with start-stop switches for the auxiliaries, as well as telltale lights and alarms. A fully equipped main engine room console was furnished by the engine builder. Complete control of all three main engines can be accomplished from this one station when desired, or the engineer can switch from engine room to pilot house control or vice versa at will.

The pilot house console contains the usual equipment plus the ship's inter-communication unit and ship-to-shore phone. A loud-speaker pick-up for directing deck hands or for emergency communication with the engine room is mounted just above the pilot's head over the console.

The Illinois Farm Supply Company, member of the Illinois Agricultural Association, is a cooperative enterprise. Back in the middle 1920's, one or two Illinois farm bureaus got the idea of es-



Operating side of one of the three main Cooper-Bessemer supercharged 6-cylinder diesels rated at 740 hp each.

tablishing an organization of their own for the purchase of lubricating oils and petroleum fuels. Other farm bureaus became interested in this particular plan, and so in 1927 the company was organized by seven farm bureau service groups and the project got under way. The organization has since spread to include a total of 84 farm bureaus, with 170,000 individual members.

Through the efforts of this far-sighted group and certain other individuals, a bulk terminal was built in 1936 at Shawneetown, Illinois. It was, of course, a very meager start, consisting of only one 8,000 barrel tank. But it marked the beginning of far more extensive handling facilities, and a new bulk terminal was built at Kingston Mines, Illinois. Here could be stored 40,000 barrels, in two tanks. To date, these facilities have grown to provide for the handling of 230,000 barrels of petroleum products at a time. Total volume last year amounted to 181 million gallons of fuels and lube oil.

Until 1942, however, delivery to the terminals was handled on a contract basis . . . not always as dependable, controllable or economical a setup as might be desired. So it was then, in 1942, that the company's first towboat was built and placed in service—the 800 horsepower diesel-engined *Blue Seal* which is still operating.

In 1944, a second towboat, the 500 horsepower diesel-engined *Wabash* went into service.

The third and latest towboat to be acquired by the company is, of course, the new 2,200 horsepower, triple-screw *Illini*.

Morris Crandall, Director of Petroleum for Illinois Farm Supply, left one of the member companies to join the organization in 1939. He is perhaps the one man most directly responsible for the acquiring and successful operation of the company's petroleum handling facilities. A quiet, unassuming, but none-the-less excited passenger on the *Illini's* initial run from Jeffersonville to New Orleans, he could hardly hide the fact that he is himself no mean authority on the ins and outs of towboat operation—from engine room to pilot house in every detail.

The Jeffersonville Boat and Machine Company is a subsidiary of the American Barge Line Company and in entrusting the complete job of design and construction to them, the Illinois Farm Supply Company knew that they could draw on a thirty year background of actual operating experience.

Cooper-Bessemer diesels were selected because of previous satisfactory experience by both parties with these engines.

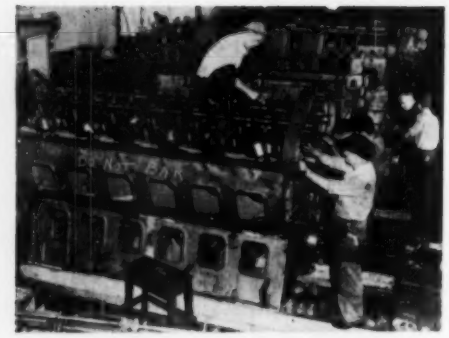
Illinois Farm Supply's seven year old *Blue Seal* had shown an excellent record of low operating and maintenance costs with an exceptionally high degree of availability.

On the other hand, the shipyard built during 1939-41, three highly successful boats for their parent company, American Barge Line, the *Patriot, Progress* and *Jefferson*. All three of these boarts were engined by Cooper-Bessemer diesels and they are still in service today and operating profitably.

Every square inch of the *Illini* has been made to count and the builders are justifiably proud of their achievement.

Boat-builders and equipment mentioned in this article are as follows:
Designers and Boat Builders:
Jefferson Boat and Machine Company.
Diesel Engines:
The Cooper-Bessemer Corporation.
Main Engine Room Console:
The Cooper-Bessemer Corporation.
Diesel Generating Sets:
Caterpillar Tractor Company.
Pilot House Controls:
Westinghouse Air Brake.
In addition to the above on the *Illini*, the towboat *Wabash*, mentioned was powered with a Superior diesel from The National Supply Company.

Illinois Farm Supply Company's compact new towboat, "Illini."



Diesel engine repair section at Harmon.

PROGRESSIVE DIESEL MAINTENANCE FOR PASSENGER LOCOMOTIVES

By JOSEPH ALBIN

This article discusses the method of inspection and the routine checking and replacement of items that are at the basis of "progressive" maintenance as practiced by New York Central System at Harmon.

SINCE 1945, when the New York Central System began to use diesel locomotives for its passenger trains, it has not been found necessary to take a locomotive out of service for a full and complete general overhaul. Some locomotives have gone as far as one quarter million miles without a major overhaul. Officials in charge of maintenance are studying records for determining a mileage figure to shoot at for a major overhaul operation.

The System's approach to the maintenance problem generally has taken the form of "progressive" maintenance, a procedure based in the main on thorough inspection and regular replacements. This article will describe "progressive" maintenance as carried out at the Harmon shop which was picked as main terminus for passenger diesel-electric power, in that it is the natural cut-off point for trains that come into New York's Grand Central Terminal. Another factor that entered in the choice of Harmon were the facilities in the electric shop that could be economically adapted.

Three tracks in the electric shop have been allotted as servicing point for the diesel locomotives. Elevated platforms and depressed floors were installed, as well as drop pits, slide slip transfer tables and cleaning vats for the engine or the complete truck. For various accessory work, such as filter cleaning, parts reconditioning and instrument testing, various facilities have been designed and set up so that this work could progress cleanly and efficiently. Flourescent lighting installations line the tracks and elevated platforms.

Progressive maintenance consumes on the average seven to eight hours per locomotive. This is done during the daily lay over period after the locomotive has made the New York-Chicago run of 2000 miles. In case of rerouting, maintenance operations will occur after 4000 miles. The number of locomotives handled at Harmon per day average 14, or 28 units, each unit of 2000 horsepower.

A preliminary inspection is done at the servicing station located at the south end of the shop. About 30 minutes are consumed at this point, which includes fueling and water replenishment. In the space of four minutes each unit will have received 700 gal. of fuel and 1200 gal. of water, on the average. New York Central's locomotives have special water tanks to carry 1650 gal. High speed pumping equipment with remote controls at the track makes possible this rapid fueling. Locomotives are equipped with Wheaton fuel connectors.

Fuel is unloaded on siding into the fuel tank having a capacity of 200,000 gal. There is an auxiliary tank of 80,000 gal. capacity. A new tank of one million gal. capacity will be going into service in the near future.

At the servicing station a sample of the cooling water is taken to check the cooling water treatment against corrosion. Applying the "concentrometer" to the water sample, the amount of treatment existing in the water is ascertained, and the amount of treatment needed to bring up to proper strength is indicated on a chart. Tests are made on four samples taken from the four engines and proper amount of treatment added.

With the exception of minor adjustments, no work is done during the preliminary inspection. Everything found by the inspectors is reported on a work slip, which is quickly routed to the office in the main shop. The inspectors comprise a crew consisting of pipefitters, electrician, machinist and boilermaker.

Further inspection occurs in the shop where the machinery inspector and the traction motor inspector have the opportunity to get into the pit and note conditions. About this time typewritten sheets will be ready on a clip, including work based on the preliminary inspection, as well as work reported en route. On the inspection report is given the repairs needed as reported by the engineman, followed by the repairs needed as reported by the inspectors. Workman sign the sheet as each item is completed or reasons are given in case any particular item cannot be repaired. In addition to this inspection report, the clip holds the routine maintenance report. Here on four sheets are listed over 100 items. Items relevant to the particular locomotive are checked off. A list of these maintenance items and the mileage at which these items are recorded is given below.

Harmon receives advance information relative to maintenance every morning from the office of the assistant to the general superintendent in charge of diesels and electric locomotives, located in the New York office. This includes notices of road failure or irregularities in operation of all locomotives maintained at Harmon, so that the shop can be prepared in advance of arrival to take care of necessary repairs or to make changes of major assemblies or components, such as, traction motors, cylinder assemblies, etc. By being forewarned, maintenance prepares to have the necessary components on hand and thus accomplishes necessary changes in the minimum of time. If the need of an engine is indicated, the required spare engine will be sitting on the floor ready to be dropped in the locomotive. Or it might be a main generator, a steam generator or traction motors mounted on various diameter wheels. Harmon is prepared to handle all phases of maintenance in connection with its diesel-electric equipment, and to this end its stock room is complete.

Dut to the fact that the Harmon shop has not been called upon to engage in major overhaul of diesel engines to any considerable extent, actual repair practices are of a limited and routine nature. But the shop is keeping a "life" record of components, which will supply important information by the time Harmon becomes geared up to an extensive program of diesel maintenance. Since 1945 which marked the advent of the diesels on the New York Central, maintenance supervisors have been studying records so as to arrive at the best procedure. Through the use of a master chart, they have been able to spot the frequency of certain jobs, and to note those that require more attention than originally estimated.

Records of engines and components are kept by serial number on a visible index file. All materials removed and applied to a diesel-electric locomotive are noted on a report sheet by items. The "life" card of the item shows its serial number, date of installation on a particular locomotive, mileage, date of removal and mileage made and reasons for removal. Thus the effective life of a particular item can be followed, and in case of changes of more than ordinary frequency it is possible to learn whether the cause is one of vendor quality or due

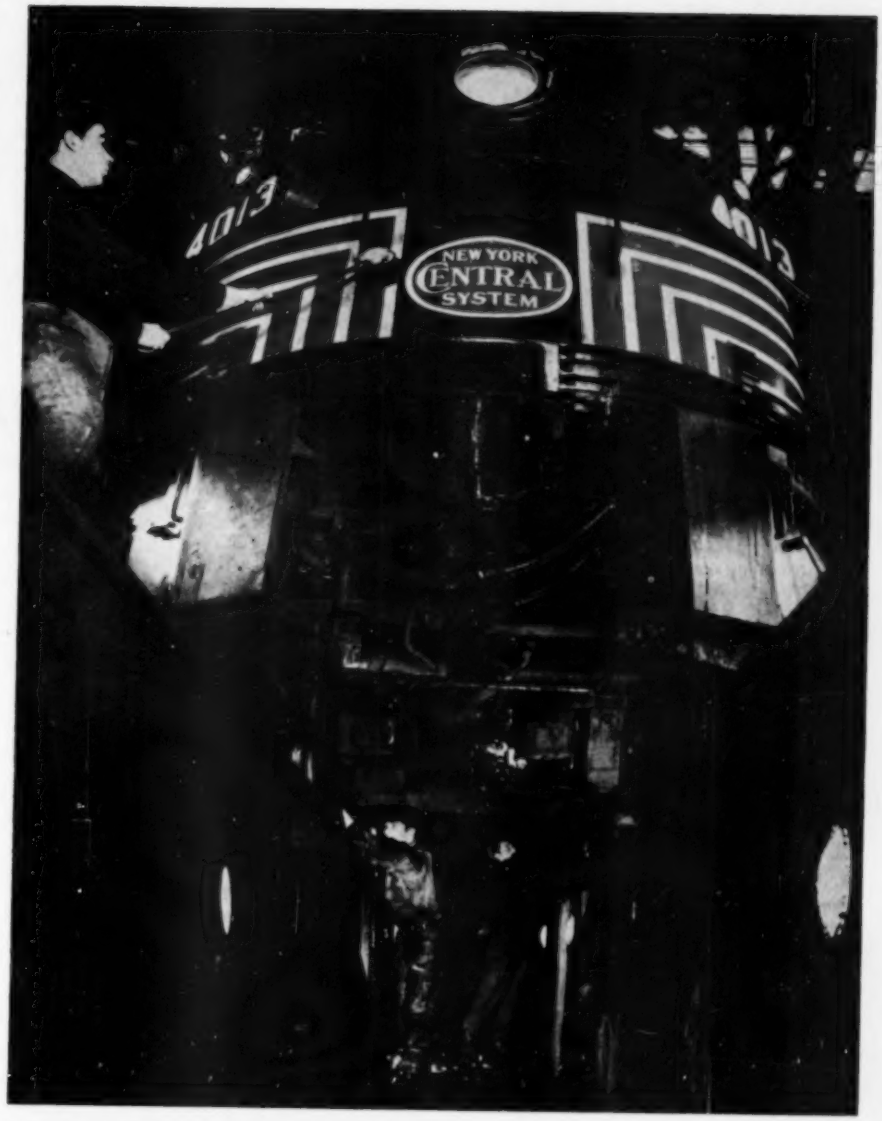
Inspection of underside of diesel locomotive at New York Central's shop at Harmon.

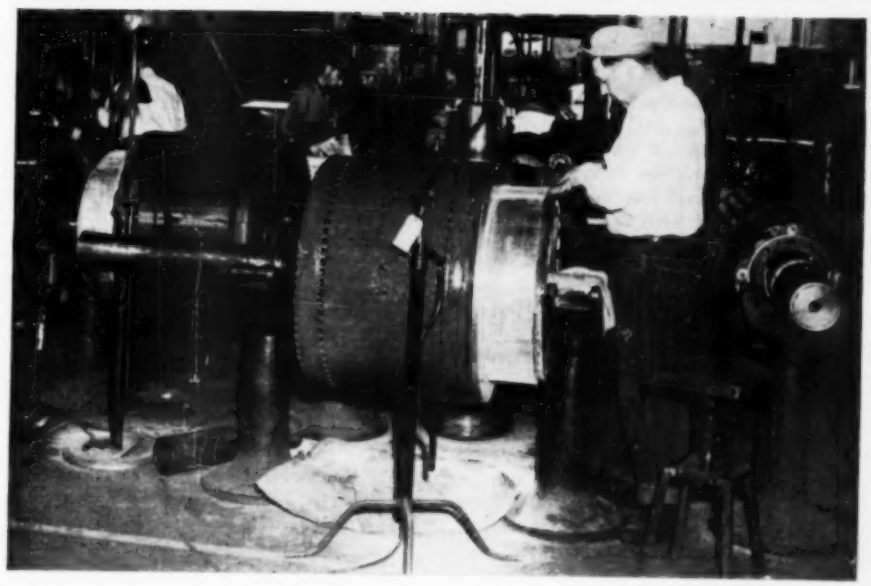
to shop procedures. Items retained for installation have been carefully inspected as well as items removed because of malperformance. Located in various parts of the repair section are inspection equipment. Portable inspection set-ups are also used in this maintenance.

It is from the records—the periodical surveys made from them, together with rigorous inspection and regular replacements, that the theme of "progressive" maintenance can be grasped.

List of Maintenance Items Pertaining to Diesel Engine Receiving Routine Check—New York Central System, Harmon, N. Y. (Figures represent mileage in thousands):

Inspect cylinder head mechanism with engine idling	2
Check engine crankcase and governor oil level	2
Drain complete air system—remove all water and dirt	2
Test automatic shutters	2
Check operation of low oil alarm	2
Test lube oil for dilution and acidity	2
Change engine air filters	2
Check engine cooling water level and corrosion inhibitor	2
Drain engine air box drain tanks—check to see that drainage is normal	2
Inspect pistons, liners and crankcase	4
Change absorbent type lube oil filters	10
Remove and clean lube oil tank suction strainers	10
Clean air compressor air filter—and lube oil tank breathers	10
Check entire cooling system—hose, piping, gauges and radiators	10
Drain water and dirt from fuel pumps, filters and tanks	10
Clean engine air boxes and change engine room air filters	10
Repack fuel oil suction filters, 6 ounces, white paste	10
Fill engine water pump oil cups	25
Change engine crankcase oil, flush and clean system, check card records	125
Change fuel oil ful-flow filter elements	50
Check operation of emergency fuel cut-off valve L.C.C. monthly inspection. Tighten cylinder head crab nuts-check injector timing and lash adjusters	50
Check injector rack, engine speed, pilot valve setting and overspeed trip	50
Tighten nuts and bolts over entire engine	100
Tighten oil cooler cores	100
Clean and flush cooling system	100
Change engine governor oil	100
Clean oil sperator elements (when auxiliary generators are removed)	
Check calibration of oil pressure and temperature gauges	100
Remove and inspect engine main bearings check card record	200
Remove and inspect engine connecting rod bearings—check card record . . . Progress bearings when piston is removed.	





Electric generator repair section at Harmon.

Rear view of municipal standby plant at Plattsburgh, N. Y. Intake air is drawn through oil bath filters outside the building. Vertical snubbers are enclosed in the brick housings.

STAND-BY DIESELS PAY THEIR WAY

By WILLIAM H. GOTTLIEB

IT is generally conceded that a standby power plant pays its way by providing insurance against interruption of power supply. The man with accident insurance doesn't feel obligated to break a leg to justify premium payments. Occasionally, though, we run across a standby plant with an impressive operating record, a dramatic demonstration of the value of engines that just sit and wait for trouble.

In less than eight years, the three 1,000 hp. diesels in the municipal standby plant at Plattsburgh, New York, have generated more than 16,000,000 kw. hrs. Operating as many as 8,000 engine hours in a single year, the engines have performed flawlessly with never an enforced shutdown. The efficiency of these normally-aspirated diesels has been phenomenal with production as high as 14.68 kw. hrs per gal. of fuel consumed at full load. Average for the eight-year period was 13.76 kw. hrs. per gallon.

Plattsburgh, trading center of the adirondacks, is a city of 22,000 population on Lake Champlain at the mouth of the Saranac River. With the private utility company in receivership and service less than satisfactory, the citizens voted in 1936 to establish a municipally-owned power system. This was finally accomplished in April, 1941, with the purchase of the electric distribution system within the city. It was planned to place chief dependence for power on the Eastern New York Power Company's four hydro electric stations on the Saranac River but the city was sufficiently experienced with the vagaries of hydro supply to recognize the need for insurance. This took the form of three four-cycle, mechanical-injction, diesels, each with eight cylinders, 17½ in. bore and 24½ in. stroke, and each rated at 1,000 hp. at the slow speed of 225 r.p.m.

At the time, this plant was large enough to carry the entire city load. Today, the load has reached a peak of 5,400 kw., but the diesels still can handle the residential and commercial demand, dropping only the industrial. With cheap hydro power available, it was intended to use the fuel-burning plant only in times of low water when the private utility could not meet the demand. The limitations of the hydro system and the growth of city requirements combined to put the diesels to the test.

The plant was put into service on April 10th to coincide with acquisition of the distribution system. In less than nine months, the diesels ran more than 8,000 engine hours, generating 5,977,100 kw. hrs, as compared with 4,822,622 kw. hrs. of purchased power. In this period fuel consumption was just 410,329 gallons, for an impressive average of 14.56 kw. hrs. per gal. Plant production has fluctuated through the years, dropping as low as 220,500 kw. hrs. in 1943 and rising again to 3,051,100 kw. hrs. in 1948. Sometimes, as in 1942, the diesels ran a great deal at a very low kw. load but high kva load for purposes of voltage correction. Needless to say, this type of operation brought fuel efficiency down. On the whole, though, load factor has been good and in five of the eight years the engines have averaged better than 14 kw. hrs .per gallon.

The normal pattern of production is apparent in the accompanying table showing kw. hrs. purchased and generated, gallons of fuel consumed, engine hours operated, and peak loads for each month of 1948. Diesel generation is sizable in January and February, drops during the Spring months, rises to a peak in July, August, September and October, and drops off again in November and December. Though conditions and totals vary from year to year, the pattern remains fairly constant.

Lubricating oil economy has been just as impressive as fuel economy. In 1948, the diesels ran a total of 4,361 engine hours and consumed only 424 gallons of lube. This means an average operation of 10,285 hp. hrs. per gallon.

This economy and continuity of service has been possible because Plattsburgh engineers planned their standby plant not merely as a makeshift capable of functioning during brief emergencies but as a complete, heavy-duty, efficient power producer. The prime movers, of course, are of rugged construction, slow speed and conservatively rated; they are designed for full-load operation over long periods of time. Each of these diesels drives directly a 700 kw., 3-hp., 60 cycle, 2300 volt generator with 20 kw. V-belter exciter.

Further insurance of trouble-free operation was the careful choice and arrangement of accessory equipment. Only clean fuel, lube and air enter the engines. Only soft water flows through the engine jackets.

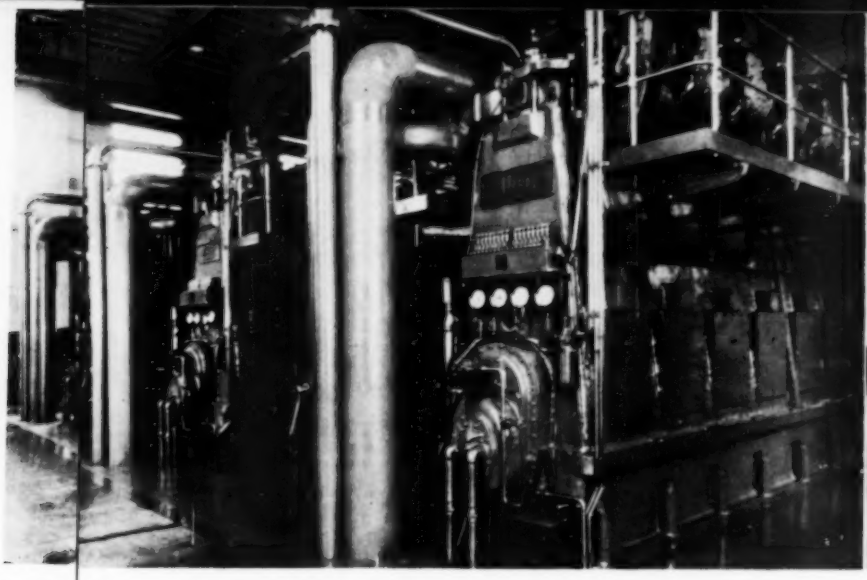
Cooling water is circulated from a hot well through the engines and through three evaporative coolers by a trio of motor-driven centrifugal pumps, one 450 g.p.m. pump driven by a 20 hp. motor and two 300 g.p.m. units turned by 7½ hp motors. To achieve maximum flexibility in the cooling system, there is a common header for the three engines, another for the three evaporative coolers, and a third for the three pumps.

This not only permits the use of any combination of pumps and coolers to serve any combination of engines but makes it possible to keep all three engines warm if one is in operation. Jacket temperature is kept at the desired level by automatic thermostatic controls which bypass water around the coolers and regulate the coolers' shutters to draw air either from inside or outside the building. City water, treated in a zeolite softener, is used for makeup.

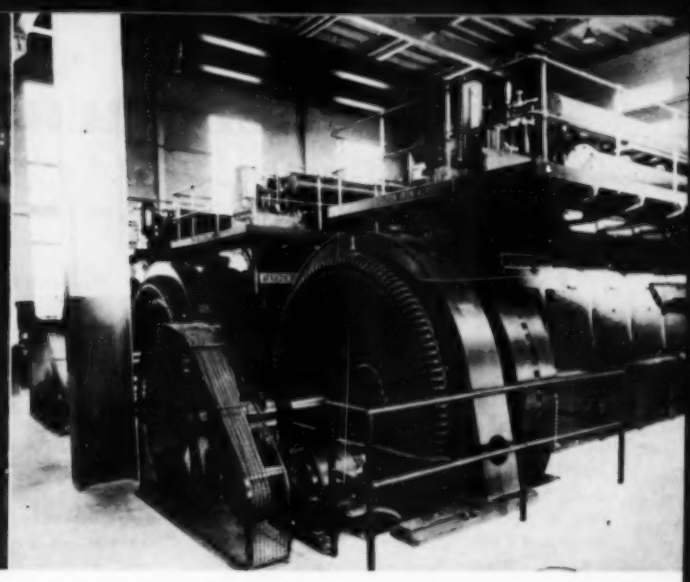
The No. 2 fuel oil is unloaded from either tank car or trucks into one 20,000 and two 12,000 gal. storage tanks, then transferred by motor-driven gear pumps through strainers and meters to three 250-gal. day tanks in the plant basement.

Fuel supply pumps built into the engines, pick up the oil from the day tanks through filters and supply the injection system.

Since the plant achieves better than 10,000 hp. hrs. per gal. of lube consumed, we can be sure no lube ever is discarded, and that oil in use is kept in good condition. Every 300 to 400 operating hours, lube is transferred from the engine



The three Fulton diesels at Plattsburgh, N. Y. View showing General Electric generators.



Rear view of Fulton diesels at Plattsburgh, N. Y., showing engine controls.

sump tank to a used oil tank and then put through a lube purifier which employs heat and Fuller's earth filtration to remove water, fuel dilution, sludge, tars, acids and other impurities. If lube needs cleaning when all three engines are running, it is possible to send the oil directly from the sump tanks to the purifier and then back to the sumps.

Lube circulated under pressure to the engine bearings is put through an oil cooler where it loses heat to water from the evaporative coolers. In addition to the engine-driven lube pump, each diesel has an auxiliary pump powered by a ¾ hp. motor. Cylinders are supplied with oil by separate force-feed lubricators.

Intake air is drawn to the engines through oil bath filters outside the building. Exhaust gases vent through vertical snubbers in brick housings at the rear of the plant. With the plant located in the heart of the city, effective silencing is essential. Starting air is provided by an automatically-controlled compressor which keeps two large horizontal tanks at 250 p.s.i. A second compressor, powered by a small gasoline engine, serves as a stand-by.

The plant has protection of an alarm system actuated by cooling water temperature, water pressure, and lube pressure. The 14-panel switchboard, set flush with the wall, has ample working space in the bay behind the board. The board is particularly well equipped, including voltage regulators, synchroscope, recording kva. demand meter, totalizing kw. hr. meters, ammeters, kw. meters, pf. meters ground detector and multipoint exhaust pyrometer. In addition, there are thermometers and pressure gauges conveniently located on each engine.

In eight years, Plattsburgh has made an unquestioned success of its municipal power system. Rates are low. In 1949, residential consumers paid an average of $.0292 per kw. hr., commercial users paid an average of $.0256, and industrial purchasers paid an average of only $.0130. Service has been unimpeachable. With the diesel plant always ready to pick up the residential and commercial load, there have been no general service interruptions. At the same time, profits have been good. By the close of 1948, the Municipal Lighting Department had made contributions of $127,325.30 to the city and paid off $133,000.00 of the electric light plant bonds. There remain just $153,000.00 outstanding at the low interest rate of 1½ percent and that indebtedness was pretty well balanced by $137,504.76 in cash on hand at the end of the year.

This success has been attributable in large measure to the availability of low-cost hydro power. Another important factor has been the foresight of city officials and engineers in constructing a diesel standby plant capable of continuous, efficient, economical service.

The power system is operated by Business Manager S. W. Niles and Plant Superintendent W. W. Gottburg under the supervision of Mayor H. F. Davies and the six-man City Council.

Months 1948	Kwh. Purchased	Kwh. Generated	Gal. Fuel	Kwh. per Gal. Fuel	Engine Hours	Peak Load
Jan.	1,893,676	427,000	29,313	14.56	577	4823
Feb.	1,851,954	272,100	18,527	14.68	379.5	4729
March	2,043,191	117,200	8,119	14.43	165.75	4245
April	1,877,875	56,100	3,984	14.08	89.25	4301
May	1,823,388	36,100	2,759	13.08	73.25	4046
June	1,671,339	96,400	7,315	13.18	139	3803
July	1,548,517	318,600	22,969	13.87	461	4303
Aug.	1,524,377	382,800	27,645	13.84	549.75	4284
Sept.	1,209,617	782,100	56,097	13.94	1119.75	4356
Oct.	2,004,522	436,900	30,955	14.11	619.25	4908
Nov.	2,357,252	64,100	4,487	14.28	99.5	5400
Dec.	2,449,675	61,700	4,264	14.47	88	5394
Total	22,255,383	3,051,100	216,434	14.09	4361	

PRINCIPAL EQUIPMENT

Engines: Three 1,000 hp., 8-cylinder, 4-cycle, mechanical-injection Fulton diesels operating at 225 r.p.m. Fulton Iron Works.
Generators: General Electric Co.
Ail Filters: American Air Filter Co., Inc.
Snubbers: Burgess Manning Co.
Evaporative Coolers: Buffalo Forge Co.
Centrifugal Cooling Water Pumps: One Buffalo driven by Louis Allis motor. Two Ingersoll-Rand Co., pumps driven by General Electric Co. motors.
Water Softener: Graver Tank and Mfg. Co.
Compressors: Two, Quincy Compressor Co.
Fuel Pumps: Two Viking Pump Co. driven by Westinghouse Electric & Mfg. Co. motors.
Lube Oil: Shell Talpa in crankcase
Shell Rudus in cylinders
Lube Oil Cooler: Ross Heater & Mfg. Co., Inc.
Lube Oil Puriler: Youngstown Miller
Cylinder Lubricators: Manzel Brothers Co.
Governors: Woodward Governor Co.
Switchboard: Westinghouse
Engine Gages: Jas. P. Marsh
Voltage Regulators: Westinghouse
Thermometers: Moeller
Pyrometer: Brown Instrument Co.
Alarms: Edwards
Switchboard Instruments: Westinghouse
Crane: Conco Engineering Works
Hoist: Budget

DIESEL FREIGHT LOCOMOTIVE

By F. H. N. CARTER

RECENTLY, through the courtesy of The Baldwin Locomotive Works and the Western Maryland Railway Company, we had the privilege of riding a 6000-hp., demonstration diesel road freight locomotive, between Hagestown, Maryland, and Harrisburg, Pennsylvania. Riding the cab of a diesel-electric locomotive is an unforgetable experience under any circumstances, but on a mountain railroad with its numerous grades and curves and with a train of one hundred and twenty freight cars weighing almost ten thousand tons, such skill of handling is necessary that it is only then that the versatility and enormous ease of operation inherent in diesel-electrics can really be understood and appreciated.

The locomotive we inspected and rode is comprised of four 1500-hp., units and the main specifications are given in the table on this page.

The engine in each of the four units is a vertical, 4 cycle, 12¾" bore by 15½" stroke, 8 cylinder diesel, developing 1625 brake horsepower, at 625 rpm., at sea level. Of robust construction, all parts are carefully and accurately made ensuring long life and a minimum of maintenance. The fuel injection system is of the solid injection type with spring-loaded, multi-hole spray nozzles. A motor driven pump transfers fuel from the storage tank through a cartridge type filter and charges a fuel line from which the individual fuel pumps to each cylinder take their supply. Relief valves and fuel cut-off valves are in the supply line.

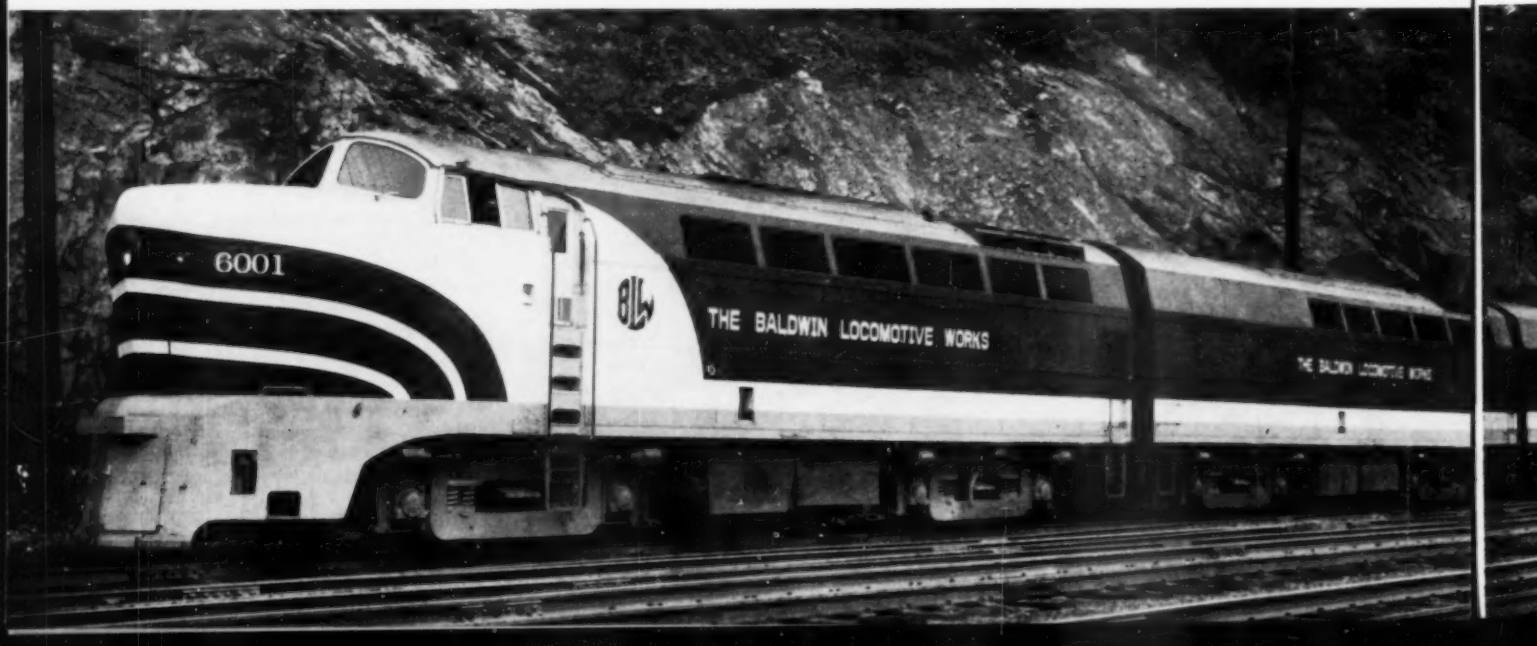
The engine bedplate of welded steel construction, is arranged with an extension to support the generator.

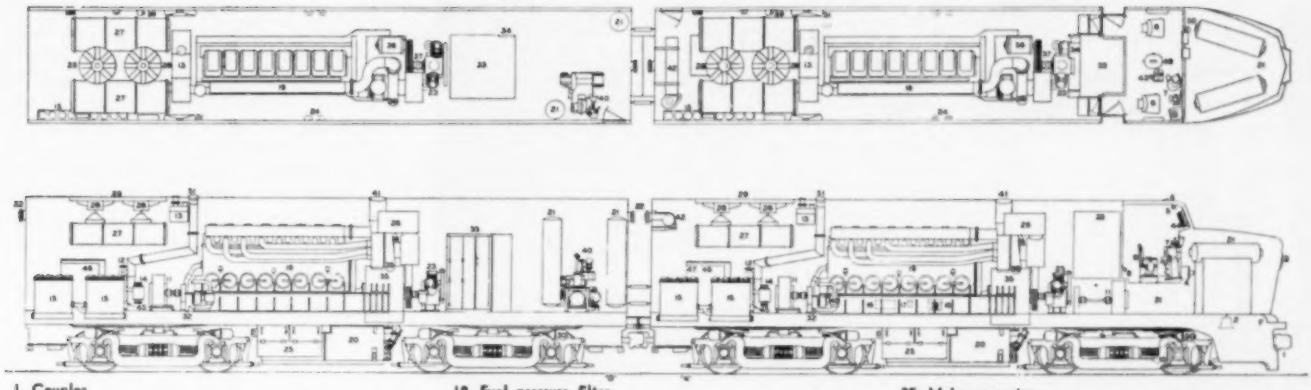
The engine is equipped with an overspeed stop of the centrifugal trip type, gear-driven from the camshaft. The hydraulic relay type governor is also gear-driven from the camshaft and pneumatically controlled by the throttle from the cab.

The lubricating oil system is of the pressure type with oil circulated by a positive displacement gear pump which is chain driven from the crankshaft. The lubrcating oil passes through a suction strainer, a cartridge type filter, heat exchanger and metal edge strainer before passing under pressure to the main bearings and through passages in the crankshaft to other engine parts.

For starting, the generator operates as a motor receiving its current from the storage batteries. The main generator is a direct current, interpole, self-ventilating, separately excited type having a single self-aligning roller bearing . The auxiliary generator-exciter is mounted on the main generator and is driven by V-belts from the main generator shaft extension. The auxiliary generator part of this unit provides the power for charging the storage batteries, control circuits, lighting and fuel pump motor. The exciter, of the differential type, provides power for exciting the fields of the main generator and in conjunction with an engine control load regulator, maintains full engine output over the operating range.

Left: Baldwin 6000-hp. diesel-electric freight locomotive for the Pennsylvania Railroad.





1. Coupler
2. Bell
3. Headlight
4. Cab heater
5. Defroster fans
6. Air horn
7. Operator's controls
8. Seat
9. Emergency fuel cut off (in cab)
10. Traction motor
11. Traction motor blower
12. Lube oil strainer
13. Expansion tank—Engine cooling water
14. Heat exchanger—Lube oil cooler
15. Lube oil filter
16. Fuel supply pump
17. Fuel suction filter
18. Fuel pressure filter
19. Diesel engine
20. Fuel oil tank
21. Air reservoirs
22. Back up light
23. Air compressor
24. Fire extinguisher
25. Storage battery box
26. Air intake filter
27. Radiators—Engine cooling water
28. Radiator fan—with motor
29. Radiator shutters—Air discharge
30. Air brake cylinder
31. Sand box
32. Water pump
33. Electrical equipment cabinet
34. Engine control panel
35. Main generator
36. Auxiliary generator and exciter
37. Compressor coupling
38. Turbocharger
39. Hand brake
40. Hostler's controls (B unit)
41. Diesel engine exhaust stack
42. Sanitary water tank
43. Trainphone
44. Signal lights
45. Standby heater
46. Auxiliary equipment cabinet
47. Train phone equipment
48. Engine lube oil pump
49. Water cooler
50. Alarm bell
51. Standby heater exhaust stack

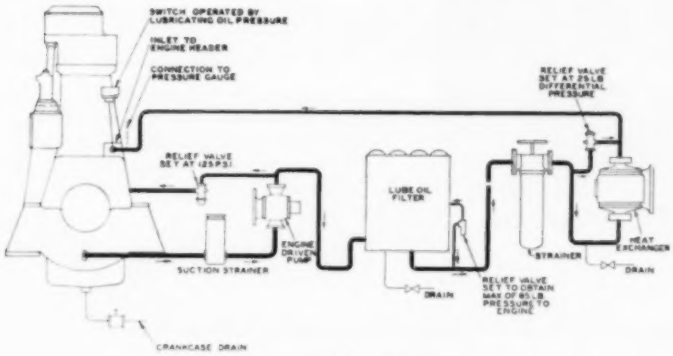


Diagram of engine lubricating system.

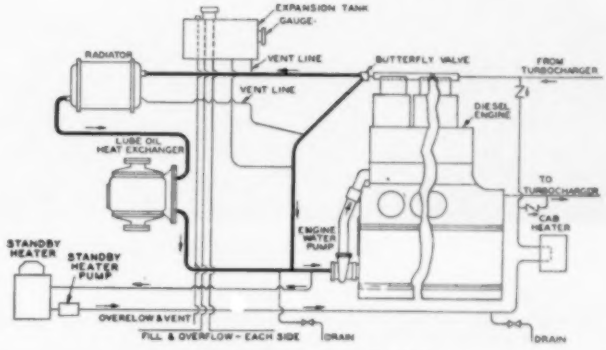
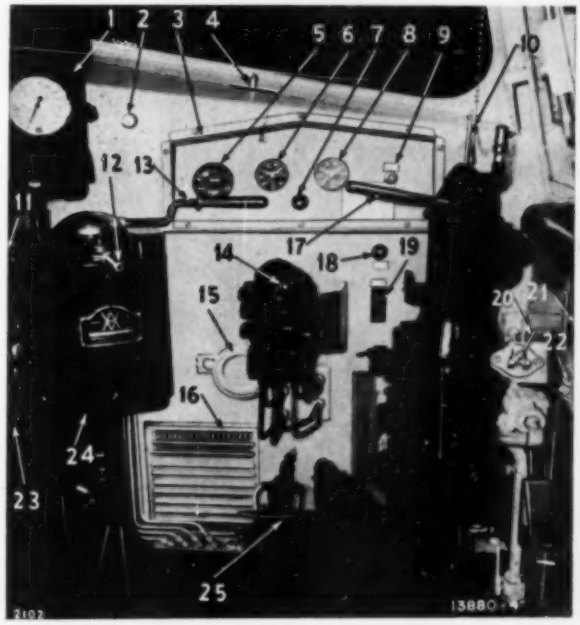


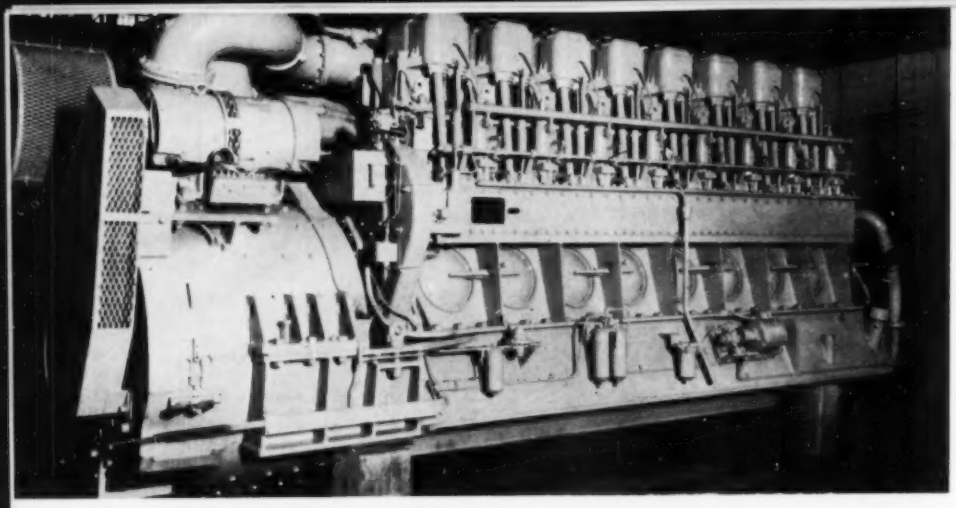
Diagram of engine cooling system.

Below: View of Baldwin demonstrator locomotive referred to in this article. This locomotive is used for tests on various railroads.

Operation Compartment and Controls

1. Speed Recorder
2. Windshield Wiper Valve
3. Engineer's Inst. Box
4. Manual Windshield Wiper
5. Load Ammeter
6. Gauge—Brake Pipe and Cylinder Air Pressure
7. Inst. Box Lgt. Rheostat
8. Gauge—Main and Equalizing Reservoir Air Pressure
9. Dynamic Braking Overload Light
10. Air Horn Valve
11. Control Switch Station
12. Reverse Lever
13. Throttle
14. Independent Brake
15. Wheel Slip Buzzer
16. Cab Heater—Engineer's
17. Automatic Brake Valve
18. Heater Motor Rheostat
19. Cab Heater Switch
20. Bell Ringer
21. Fire Extinguisher Pull Box
22. Headlight Switch
23. Train Phone
24. Master Controller
25. Deadman Pedal





1500-hp., diesel and generator. One of these is mounted in each of the locomotive sections.

View showing details of four-wheel truck

The traction motors are series wound. They have single reduction gearing to the axles and are force ventilated, each locomotive unit having two traction motor blowers, belt-driven from the engine shaft. The characteristics of the traction motors and generator are matched in such a way that the desired performance is obtained by using a permanent series-parallel connection, thereby eliminating the necessity of transition and its complication of control. All control equipment is electro-pneumatically operated and easily accessible for inspection at all times.

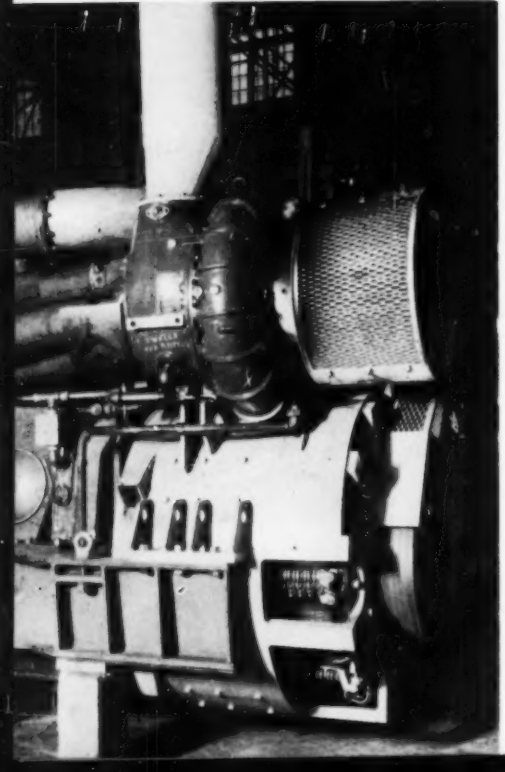
Other points that we were interested to note were the unusual position of the oil filters which are enclosed in a compartment permitting inspection and maintenance by the simple removal of a conveniently located panel on the outside of each locomotive unit, and the position of the dynamic braking resistance grids. These are located in the radiator compartment built into the roof structure just behind the engine on each unit. Automati shutter control diverts cooling air from the radiators to the grids when dynamic braking is applied, but allows sufficient air to pass through radiators to maintain proper engine temperature.

We understand that a considerable number of these locomotives are already giving efficient service on several railroads.

SOME OF THE EQUIPMENT

Baldwin 6000-hp road freight locomotive.
Baldwin diesel rated at 1500-hp at 625 rpm.
(one for each of the four units)
Westinghouse—electrical equipment.
Harrison Radiator—water
Harrison heat exchanger—oil cooler.
Westinghouse—air compressor.

View of generator and engine turbo-charger on 1500-hp., diesel-generator set, Baldwin freight locomotive.



Diesel-Electric Road Freight Locomotive 6000 HP Demonstrator

Some General Characteristics

		A-Unit	B-Unit	6000 HP Loco.
Diesel Engine	Supercharged HP for traction	One 8 Cyl. 1500	One 8 Cyl. 1500	Four 8 Cyl. 6000
Supercharger		Turbo Type	Turbo Type	Turbo Type
Driving Motors	Number Type	4 370	4 370	16 370
Journal Bearings	Type Size	Roller Bearing 6½" x 12"	Roller Bearing 6½" x 12"	Roller Bearing 6½" x 12"
Wheels	Driving Idling Diameter	4 pairs None 42"	4 pairs None 42"	16 pairs None 42"
Running Gear Wheel Base	Swivel Trucks Each Driving Truck Total	Swing Bolster 9'-10" 38'-0"	Swing Bolster 9'-10" 38'-0"	Swing Bolster 9'-10" 38'-0"
Total Weight (Approx.)	In working order. On Drivers Light Front Truck Rear Truck	363,000 263,000 249,000 128,000 135,000	256,000 256,000 242,000 124,000 132,000	1,038,000 1,038,000 982,000 ....
Max. Overall Dimensions	Width Height Length	10'-6" 14'-10½" 54'-4½"	10'-6" 14'-10½" 52'-7"	10'-6" 14'-10" 213'-11"
Min. Radius Curvature	Loco. with train	273' (21°)	273' (21°)	273' (21°)
Supplies	Lube Oil Fuel Oil Cooling Water Sand	200 gals. 1200 gals. 300 gals. 20 cu. ft.	200 gals. 1200 gals. 300 gals. 20 cu. ft.	800 gals. 4800 gals. 1200 gals. 80 cu. ft.
Dynamic Braking	All Units			

DIESELS ON THE FARM

THE use of diesels on the farm has long been accepted in all parts of the country and the pictures shown on this page give only four examples of the numerous applications to which they are put. From ploughing through cultivation and irrigation to harvesting, diesels have long since become the farmers' reliable workhorse. The tractors shown are all **Caterpillars**.

Harvesting wheat in Montana. Diesel tractor pulling 24-foot combine in Montana.

Disking by diesel before planting. Tractor pulling 36-foot tandem disk in Montana grain country.

Cultivating irrigation furrows in California orange grove. Diesel tractor pulling 8-foot 3-bar spring-tooth cultivator.

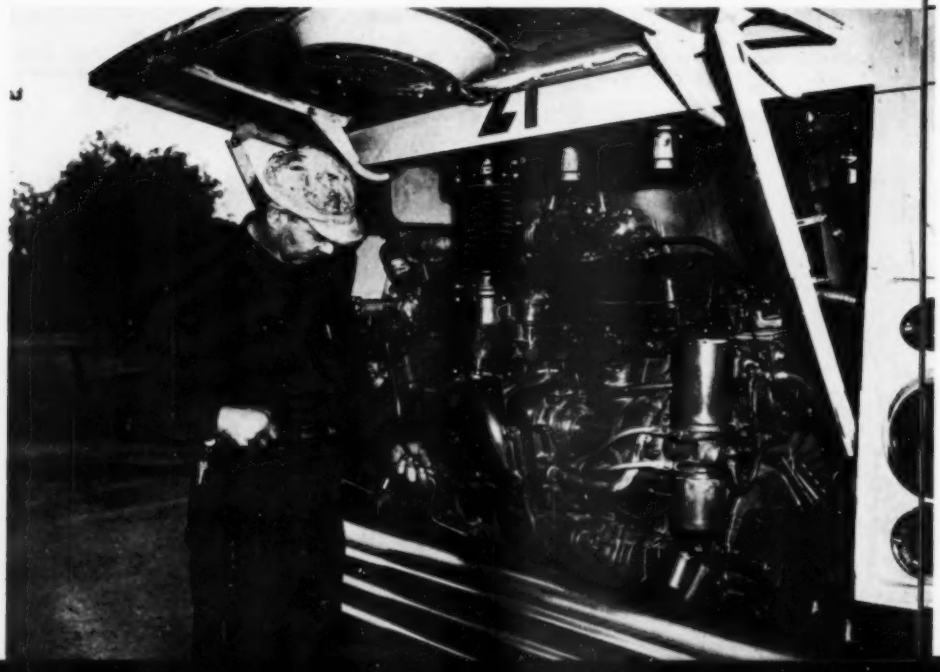
Diesel tractor hauling 300-gallon water tank for irrigating newly planted avocado trees in California.

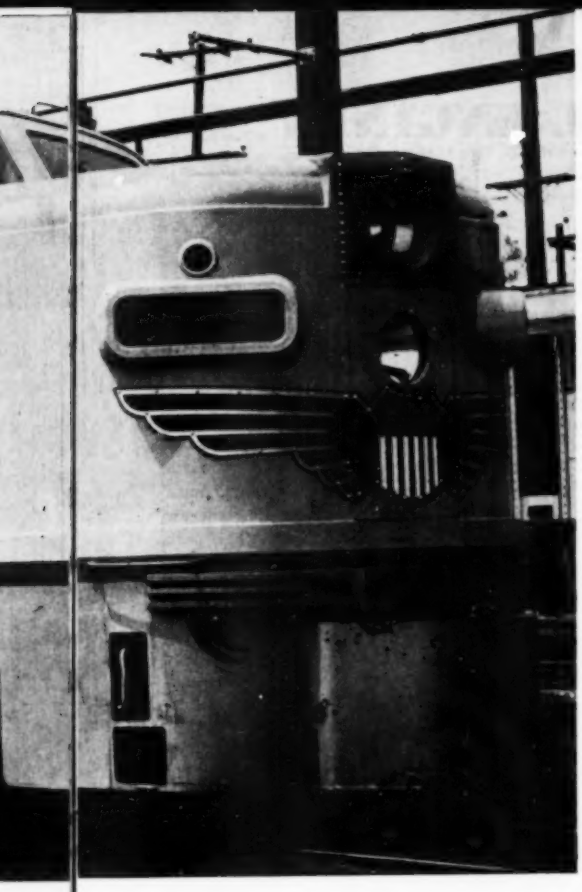
Double diesel duty. Diesel locomotive and diesel-engined bus of the Union Pacific Railroad.

DOUBLE DIESEL SERVICE ON THE UNION

Checking the air conditioning equipment.

U.P.'s garage foreman at Los Angeles, Mark F. Mariger, examines the General Motors, 2 cycle, 200-hp diesel engine of one of the new buses.





UNION PACIFIC

By FRED M. BURT

LATE additions to the Union Pacific's diesel equipment are ten ultra-modern busses engined with 6-cyl. 2 cycle, diesel engines, supercharged to 200-hp. They provide a complete daily, direct transportation service for the railroad's passengers (and their baggage) between U. P.'s East Los Angeles station and outlying suburban areas.

There are three scheduled services to and from this convenient suburban station, with busses meeting four incoming main line trains at 6:30 A.M., 8:40 A.M., 10:10 A.M. and 2:55 P.M. scheduled arrivals. Also picking up passengers to depart at 11:25 A.M., 12:25 A.M., 5:20 P.M. and 7:55 P.M. In twenty years of operation of this bus service, no train has been held up more than 3 minutes, and only twice for that long.

The East Los Angeles–Long Beach–San Pedro service, has 10 scheduled passenger stops, 66.6 miles round trip, with 184 possible traffic and other stops; to Pasadena–Eagle Rock–Glendale, 6 passenger stops, 39 miles round trip, 129 possible stops; to Whittier–La Habra–Fullerton–Anaheim, 46.8 miles round trip, 118 possible stops. Passengers may get off at other points en route, are also similarly picked up through advance request, with memo made up for the driver.

This is the schedule pattern of an extremely satisfactory and convenient service to supplement passengers' use of the Union Station terminus in downtown Los Angeles. These new busses also provide the last word in comfort with their sponge rubber reclining seats, individual reading lights, padded leather arm rests, indirect lighting in overhead baggage racks, and air conditioning.

Blowers draw outside (1/5) and re-circulated (7/5) air through two filters in the rear to pass it over the cooling coil which extends the full width of the bus, at the back of the rear baggage compartment. (Originally designed for 41 passengers, these busses were converted to 32 passenger units to make room for the large baggage compartment.) The four ton, refrigeration unit for the cooling coils, with its gasoline engine, compressor and other units, is located amidships, with full automatic control from the panel at the driver's left.

For heating on cold days (and they do have them in Los Angeles area, in spite of the Cahmber of Commerce) there are three heaters on each side, with coils for hot water from the engine cooling system; also a heater for the driver and heating to supply hot air at three speeds through two ducts for windshield de-frosting. Heat is controlled at proper temperatures automatically or manually, with a thermostat in the rear controlling filtered hot air circulation. Thus passengers can leave air-conditioned trains to step immediately into a similar bus atmosphere. The busses are 35′ long, 247″ wheel base, 96″ outside width, overall height loaded 112 7/8″, head room in aisle 76 1/8″. Gear ratios are–high gear-direct drive 4.125 (converted from 3.55), 3rd is 6.1875, 2nd–10.3125, and 1st–14.925.

They are housed in a modern 118′ x 48′ garage, with 12 14′ stalls, fully equipped for everything from trip fueling from a 20,000 gal. underground diesel oil tank, on through the other inspections, servicing, repairs, and overhauls–"A" at 1,000 miles; "B"–4,000 miles; B plus–8,000 miles; "C" –15,000 miles (each more inclusive and repeating previous ones) and "D" the complete overhaul. These are planned but as the busses started operation May 1, 1949 and operate mostly within the 75-200 mile range daily, very little work has been done other than routine servicing.

There are three garage mechanics with one always on duty seven days a week, between 5:30 A.M. and 8:00 P.M. Thirteen drivers work on six day weekly schedules. E. H. Jones is Superintendent of this Union Pacific Stage Co., with Mark F. Mariger as Garage Foreman. These men were transferred from Cedar City, Utah where they had been operating U.P. busses into Bryce, Zion and Grand Canyon National Parks.

This was in 1929 when the East Los Angeles Station was built for this more convenient service; steam trains had been handling this suburban service to the old Union Station.

They started out with one each of five makes of busses adding three more later. In 1934 changing to one make, using them till this clean sweep and fresh start was made, with butane as fuel latterly. In the old operation the busses averaged about four miles per gallon of gas or butane. The new diesels are averaging between 6.5 and 7 miles per gallon.

The busses are beautifully finished in attractive colors outside and inside. Each driver keeps his own bus well simonized. Eight busses are kept busy daily on regular schedules, but U.P. Stages may have to use them all and charter others to handle any large, special movements of persons on regular or special trains.

Starting from scratch under the best of operating conditions, it will be interesting to see what operating, cost, repair and overhaul records will be developed in the years to come, before these busses will require replacement.

The diesel busses in this article were built and engined by General Motors Corporation.

Ten new General Motors Corporation, diesel-engined buses recently delivered to the Union Pacific Railroad in Los Angeles. All are painted the road's well-known "Streamliner" colors.

AIR CLEANERS FOR DIESEL ENGINES

by JAMES MYERS*

There can be little question that filters for the intake air on all types of engines under nearly all kinds of operating conditions have proved the filters to be accessories which quickly repay their cost. This is shown as direct savings, indicated by decreased engine wear, and savings resulting from fewer unscheduled operational delays. The initial cost and the cost of servicing air cleaners is small compared to the overall purchase and operational cost of an engine. It is a unique case where an operator can justify the elimination of air cleaners on his engine.

Many types of air cleaners are available; some vary in basic principles; others vary in detail design. It is not the intention in this article to compare or present detail features of air filters but to point out problems and requirements of air filtering which should be considered by engine manufacturers and operators in the selection of air cleaners for each and every particular application.

Justification of Air Cleaners

It is of primary interest to the operator that he be able to justify the installation of any piece of equipment on his engine. The natural question that arises is, what direct saving can be realized or what indirect value can be obtained by the addition of the equipment.

In the case of air cleaners it has generally been obvious from observation of the dust and dirt conditions under which the engine must operate that air filtering was needed. For this reason there has been little effort to establish by controlled tests the dollar and cents difference in operation with and without air cleaners. Most of the test and development effort has been placed on improvement of filtering efficiency and establishment of what type of filtering means is best suited for various applications. There are, however, many interesting case histories where the effect of operation with and without air cleaners is clearly significant.

The initial operation of diesel engines on a major railroad resulted in cylinder overhaul work after each 3000 miles of running. Design improvements were made on the engine, one of which was the installation of air cleaners on the car body and on the engine air intake. At present this operation requires servicing at approximately 1,000,000 mile periods. This tremendous increase in the overhaul period is not, of course, due only to the air cleaners; however, it is acknowledged that much of the piston and ring wear difficulty was directly attributable to the lack of air cleaners on the engine air system.

Familiar are the many reports of wartime operation in desert areas where engine operation was impossible without air cleaners. These conditions were exceptionally severe; however, equally numerous are records of normal condition installations where, prior to the use of air cleaners, piston and ring wear was the factor which determined the engine tear down period, but with this condition improved by the use of air cleaners, engine components other than pistons and rings became the controlling factor in the determination of overhaul time.

One brief example is that of a west coast engine manufacturer who was repeatedly called upon to replace worn rings in much shorter engine life periods than his service tests indicated should be necessary. Investigation revealed that the air cleaners were either, not serviced at all, or, in some cases, were not even installed by the operators. Inquiry disclosed a lack of knowledge on the part of the operators as to the importance of proper use and servicing of the filters. The manufacturer hastened to put out more complete information to his users with the result that the replacement parts problem was reduced to the normal rate to be expected.

Perhaps one of the most important problems in engine air filtering today is the determination of what type of dust or dirt is harmful to an engine. More clearly, how small must the dust particle be before it can be digested by the engine without adding to normal wear. This knowledge is of importance to the air filtering industry since it will define the limits to which adequate filtering must be provided. It will be of interest to the operators since it will assist them in evaluating the various basic types of air cleaners available. Plans are in progress to establish controlled tests to determine the effect of various dust types and particle sizes on engine wear.

Selection of Air Cleaner

The engine manufacturer or operator must select the type of air cleaner he needs in accordance with the particular requirements of his installation. Some considerations are listed below; however, since the problem of air cleaning has become high specialized it would be wise for the user to consult with filter manufacturers before making a final selection.

The size of any type of air cleaner to be used will depend largely upon the volume and velocity of the air which must pass through the cleaner.

It is a simple matter to determine the amount of air the engine will require, but it is not so simple to convert this value into the air flow requirements of the cleaner. The velocity of the air through the filter will have a dominant effect upon the cleaning efficiency, therefore it is necessary to determine the peak or surge velocity as established by the engine design. For example, a single cylinder four-cycle engine may have an air volume requirement of 200 cfm as computed on the basis of displacement, yet because air is taken into the combustion chamber on every fourth stroke only, the capacity of the air cleaner must be computed on the basis of the time the air is actually flowing into the cylinder. This peak velocity will vary with the number of cylinders, type of engine, RPM etc. and in many cases, particularly on multi-cylinder engines will reach a practically constant flow condition through the filter. It is obvious that if the correct air flow is to be supplied to the engine and the air properly cleaned, the air filter must be sized to the design conditions of the engine.

Information on this problem may be obtained from the various air cleaner manufacturers and their services should be utilized. A point often missed in sizing air cleaners for an engine is the efficiency of the cleaner over the full operating air flow range. The air cleaner must be efficient at all operating throttle positions and the operator should make certain that the cleaner will not pass dirt at one or the other end of the air flow range.

Some degree of pressure drop will exist in all air cleaners. This pressure loss at the engine air inlet may not be objectionable under part throttle conditions; however, at full throttle a measureable horsepower loss may result if the air cleaner has a high pressure drop. Care should be taken to learn not only what the initial or clean filter pressure drop is but to also ascertain what the average pressure drop will be over the period between servicing, and the pressure drop existing just prior to servicing.

On some installations, particularly where a turbocharger is used it is important to consider the effect on the engine or supercharger if the filter becomes clogged to the point where air flow to the engine is reduced materially. Cases have been experienced where the supercharger has failed as a result of over-speeding, which in turn was caused by air starvation. It can be assumed that with proper servicing this condition will not occur. However, there are filters available which when completely loaded with dirt will still permit sufficient air to flow to the engines. This safety feature should be considered by the engine user.

Installation Requirements

Space available for installation of the air cleaner would appear to be an obvious consideration. Occasionally, however, mere physical clearance is the only thing investigated with the result that poor air inlet conditions to the cleaner exist, or

*James Myers of the Farr Company, Los Angeles, California.

servicing of the unit is made difficult because of inaccessibility. Intelligent consideration of the air supply to the cleaner inlet may well improve the efficiency of the cleaner in terms of longer periods between servicing. For example, on mobile installations, use of louvers or hooded air inlets ahead of the cleaner, placed in such a way as to cause the air to turn from its normal path of direction before entering the cleaner, has improved filter operation, since much of the heavier dirt is thrown out of the airstream when the air makes the turn into the cleaner.

Proper air flow distribution over the entire filter face-area of the cleaner is highly important. Evenly distributed air flow can be affected by the design of the cleaner itself or by the installation. A test should be made to assure a good air flow pattern.

The effect of engine vibration on the filter housing and filter media is a major consideration. The method of support, the assembly details and the ability of the filter media to resist packing or compression should be examined. Experience has shown that most operating personnel will continue to run the engine with the filter partially damaged or completely fallen off, since, in most cases, the engine apparently runs just as well without the air cleaner.

As mentioned previously, some engines will have a pulsating air flow condition which results in a structural load on the air cleaner filter media. This continually changing force on the filter tends to gradually break the assembly down. Some units provide a surge pressure relief valve, others accommodate these loads by structural reinforcement.

Type of Filter Needed

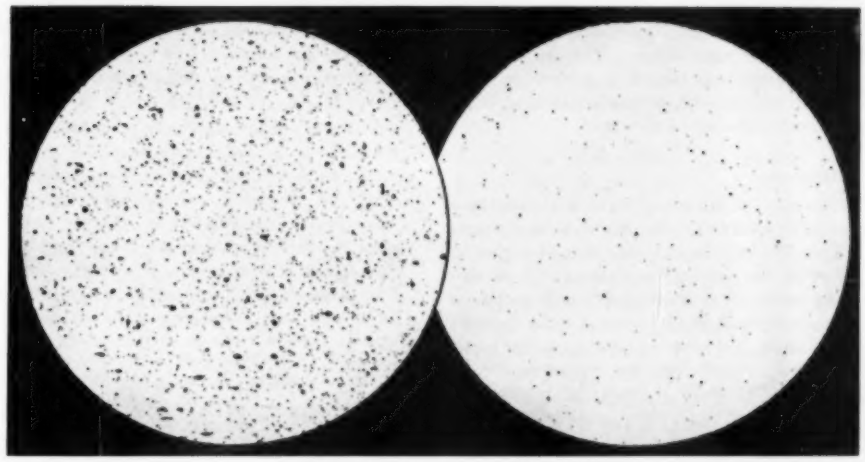
Several basic types of engine air cleaners are in common use at the present time. The principal ones may be generally classed in one of the following groups:

Impingement filters
Oil bath filters
Strainer filters.

There are some engine installations where only one of the above groups can be used, but generally speaking all types can be applied to most installations and it remains for the operator to evaluate each, considering points such as the following:

Type of Dust or Dirt to be Filtered

As noted previously there remains considerable work to be done to obtain data on dust particle size with respect to effect on engine wear. At present certain standard dusts are used by the filtering industry for testing and efforts are being made to establish standard testing methods which will enable engine manufacturers and operators to better comparatively rate different types and designs of air cleaners. The efficiency of an air cleaner will vary to some degree with the type of dust encountered and in some cases where unusual dust, such as the by-product of a manufacturing process, is encountered, the operator would do well to submit a sample of the dust to the filter manufacturer for his comment as to the air cleaner efficiency and service life with that particular dust.



Airborne dirt and dust can be harmful and costly.

Quantity of Dust

The dirt holding capacity of cleaner will establish the servicing period required. The operator must determine this period by observation of the cleaning job and the increase in pressure loss through the cleaner as dirt loading progresses. Some types of cleaners will show an increase in cleaning efficiency as the dirt load builds up. This is accompanied by an increase in pressure loss; therefore the engine operator should examine both the efficiency and pressure loss curves of any cleaner to properly compare different types.

Air Velocity Through the Cleaner

The detail design of different cleaners is such that some require lower air velocities through the media for the efficient cleaning than do others. Basically, high velocity type filters will require less filter area for a given air flow requirement; thus a small unit or fewer units are required. This may be important in installations where space is limited. Uniform air velocity over the entire face of the filter is also necessary to obtain the most efficient cleaning job.

Filter Efficiency

Efficiency curves, whether they are for engines, air cleaners or washing machines are usually given in terms of the most favorable conditions.

The operator in selecting an air cleaner should find out what the efficiency is on: a clean unit, a completely loaded or dirty unit and what the cleaning efficiency and pressure loss curves are over the period between these two conditions.

Servicing

The cost of servicing is of major importance to the operator and he should investigate not only the cleaning methods required but also the cost of cleaning equipment, cleaning materials, oil, cleaning time and the man hours required to remove and reinstall the air cleaner on the engine. Occasionally only false economy is attained when filters are only partially cleaned in order to cut down labor costs or to avoid the cost of proper cleaning equipment. Such treatment only results in shortening the period between servicing and does not fully utilize the full capacity of the air cleaner.

Useful Life

The anticipated useful life of the air cleaner will be a factor in weighing the initial cost of the installation. The operator will be able to draw his own conclusions based on the structural details of the assembly, viz: the filter media construction, the expected degree of rough handling in the field and the effect of the type of servicing required for the particular cleaner. Problems such as moisture corrosion, salt water effect, deterioration from acid fumes, etc., must be considered. Future troubles can be avoided if proper materials and surface coatings adequate to handle the air conditions expected are obtained.

Initial Cost

As always, initial cost of an installation is one factor that stands out clearly for the buyer, and it is an important one. Too often, however, this single point is the determining factor in reaching a decision. However, before decision, sufficient consideration should be given the economy determining other problems mentioned in this paper. The true economics cannot be determined on initial cost alone but should be balanced with all the other considerations.

Silencers

The use of silencers on the air intake of large diesel engines is becoming an increasingly accepted practice; that is on an engines where the air intake noise is noticeable above the general noise level of the engine. Air cleaners are available which incorporate silencers and in those installations where the air cleaner is remotely located from the engine air intake the silencer is a separate unit mounted directly at the engine intake. Silencers are available for many diesel engines in current use. In cases where no silencer unit is available manufacturers of such equipment can

supply a silencer when given information of the sound levels and frequency ranges in which the objectionable noise occurs. If engine manufacturers or operators do not have access to sound measuring equipment, assistance may be obtained from manufacturers of silencers.

Maintenance

The type of maintenance and the periods between servicing will vary considerably with different types of air cleaners. In the early days of engine air filtering, the dry or impingement type of filter was universally used; this was partly because of the advantage of easy inspection and the simplicity of cleaning. The design of air filters at that period was such, however, that they clogged rapidly, introduced high pressure losses and required too frequent cleaning. These problems created a demand for improvement in the operation of air cleaners and the oil bath filter was developed which materially increased the usefulness of the air cleaning system. As a result, the oil bath filter is in popular use today. In recent years considerable improvement has been made in the design of impingement type filters and now the use of this type is again becoming widespread. The most outstanding example of this use is railroad diesel engines which are equipped, on every line, with impingement panel filters. This point is brought out since, because of the early day experience, a general impression persists that impingement filters are not satisfactory for engine air intakes, yet recent records show that this is not the case.

Provision of proper maintenance of the air cleaner, regardless of its type, is an operation requirement that should not need emphasis, and yet it is all too frequently overlooked or neglected. Unfortunately, the evidence of such neglect appears in the form of damaged engine parts and interruption to service, both of which are costly. The operator cannot expect the air cleaner to do a good job of removing dirt from the air without periodic removal of the dirt from the cleaner.

Methods best suited for servicing air cleaners will vary with each type and with the dust and dirt conditions. The operator should obtain the recommendations of the cleaner manufacturer, and particularly he should make sure that his crews have and follow the service instructions.

Summary

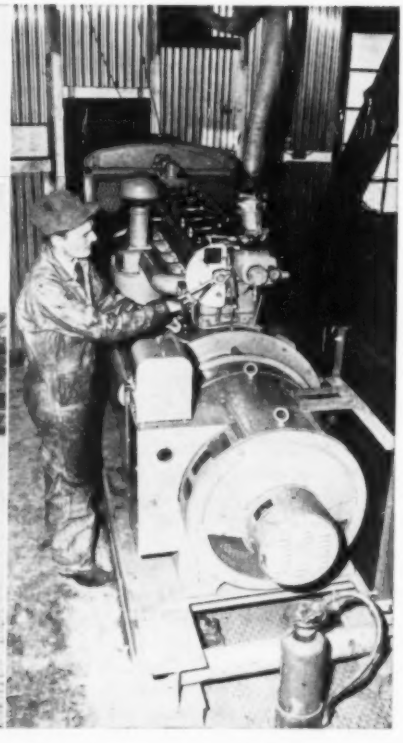
The following brief outline of points to be considered on an air cleaner application may be useful to engine manufacturers and operators:

1. Direct Saving
   a. Reduced engine wear
   b. Reduced engine operating costs
2. Indirect savings in fewer unscheduled operating delays
3. Engine operation
   a. Air flow required
   b. Pressure drop limits
   c. Protection against engine air starvation
4. Installation requirements
   a. Space available
   b. Maintenance accessibility
   c. Air flow conditions to the cleaner
   d. Vibration effect on cleaner housing and filter media
   e. Air flow surge effect
5. Type of filter desired
   a. Character of dust to be filtered
   b. Quantity of dust
   c. Air velocity through filter
   d. Filtering efficiency, clean, dirty and throughout the operating period
   e. Servicing period required
   f. Maintenance and cleaning methods, materials, equipment and labor costs
   g. Installation and removal labor costs
   h. Useful life of cleaner
   i. Initial cost
   j. Service history and record.

DIESEL GENERATORS ON DERRICK BOAT

Derrick boat engaged in dredging operation.

View of one of the diesel-generator sets furnishing current for the derrick.



DERRICK boats are absolutely indispensable in river construction work where they handle dredging, the loading and unloading of barges, move construction materials, drive piling and carry out other numerous operations.

On early boats of this type, steam engines supplied the energy for operating the hoist mechanism, for turning the whole superstructure on the turntable and for lowering and raising the huge anchoring spuds. An improvement was the use of electric motor drives connected by transmission lines to an electric power supply on shore.

The need for a shore connection has been eliminated by the inboard installation of diesel-generator units. The particular derrick boat illustrated in this article has two such units, one on each side of the hoisting mechanism. Each consists of a diesel direct coupled to a 100 kw, 1200 rpm, "packaged" generator. The generators are provided with automatic synchronizing controls which automatically parallel them at the push of a button. The "packaged" feature eliminates the need for a switchboard since ammeter, voltmeter, voltage regulator and automatic synchronizer are mounted on the generator.

Electric Machinery Manufacturing Company of Pittsburgh supplied the generators while the Murphy Diesel Company of Milwaukee furnished the diesel engines.

DIESELS MEET NEEDS OF ENLARGED COTTON GINS

By WILL H. FULLERTON

NEW MODEL diesel engines are providing ginners with the power they need to keep pace with the present trend toward expansion and modernization of gin facilities. Installation of ultra-modern cleaning equipment and of additional stands, to handle heavier seasonal loads of mechanically-picked cotton, gives gin owners a power plant problem which many of them are solving with newly installed diesels in the 100-200 horsepower class.

Applications of engines of 180 horsepower, for example, illustrate the suitability of diesels in this class to the power requirements of many four 80-saw stand gins. This size has proved popular with owners of two- and three-stand gins, enlarging their facilities, because they often find it supplies enough power to make practical the addition of new blowers, driers, separators and similar units at the same time as another stand.

Adding a new stand generally raises the total equipment load beyond the capacity of the engine previously used and necessitates replacing it with more powerful, or installing auxiliary engines. In most cases, it is found more economical to drive all main components of a gin with a single engine, as shown in the experience of McCartney Mercantile Company of Newport, Arkansas. Formerly a two-stand gin with all the equipment driven by a 100-horsepower diesel, the McCartney installation was enlarged and modernized in 1947. A new stand was added, and the power requirement was raised to approximately 145 horsepower, to operate three 80-saw Continental stands; a 45-inch, a 30-inch and a "3½" fan; two cleaners; a burr extractor; drier; hot air fan, and baling press. Because larger diesel units were in short supply at the time, a 50-horsepower electric motor was installed to handle the extra load. In the 1947 ginning season, owner Charles McCartney reports, the power cost of this motor alone was 50c per bale of cotton.

A 180-horsepower diesel was installed in 1948, McCartney says, "to cut expenses and to simplify operations." He adds, "It is working out fine. Our entire fuel cost per bale is now less than the cost per bale for electricity alone in 1947." Figures for 1948 production of 1900 bales of cotton, show that fuel cost fell to 45c per bale when this replaced the other two units. The gin turns out approximately three bales an hour; engine uses 9.6 gallons of 14c fuel in that time.

A larger unit also effects operational economies by providing a "cushion" of extra power that will handle the added load of the baling press when it is in use, without "dragging down" and slowing other operations.

At Axtell, Texas, the Axtell Gin Company is operating at a fuel cost averaging 26c per bale, with a 180 horsepower diesel compared to reported costs of as much as $1.50 per bale for similar gins in the area using electric power. The engine was installed last fall, after the original power plant proved inadequate for a load including five 70-saw stands; three fans; a drier; burr extractor; 100-foot conveyor; scales, and press. Running two tests with the new engine, the gin processed 1400 pounds of raw cotton in 14 minutes, and 2000 pounds in 17 minutes. Average fuel consumption is now two gallons of 13c oil per bale of cotton.

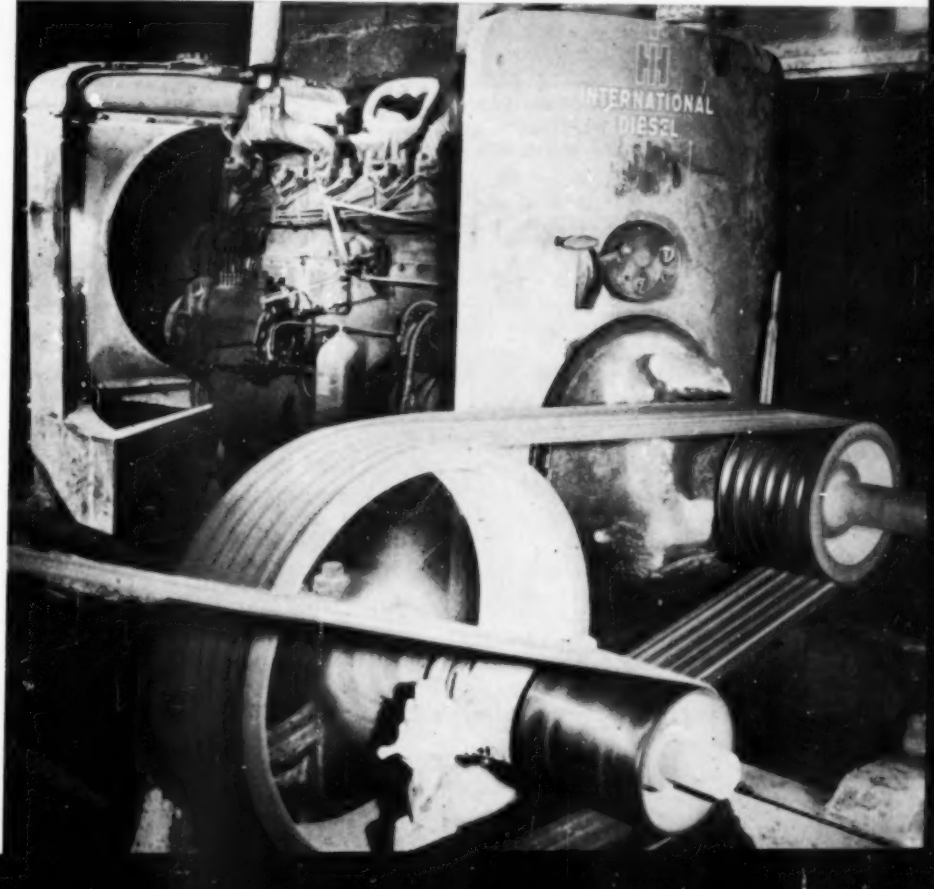
Other Southern gins which have recently installed the same diesels include Shannon Gin Company, Pocahontas, Arkansas; the Marksville, Louisiana, Square Deal plant of Independent Mill and Gin Company, and Bledso Gin Company of Begota, Tennessee. All three replaced smaller power plants, after enlarging facilities.

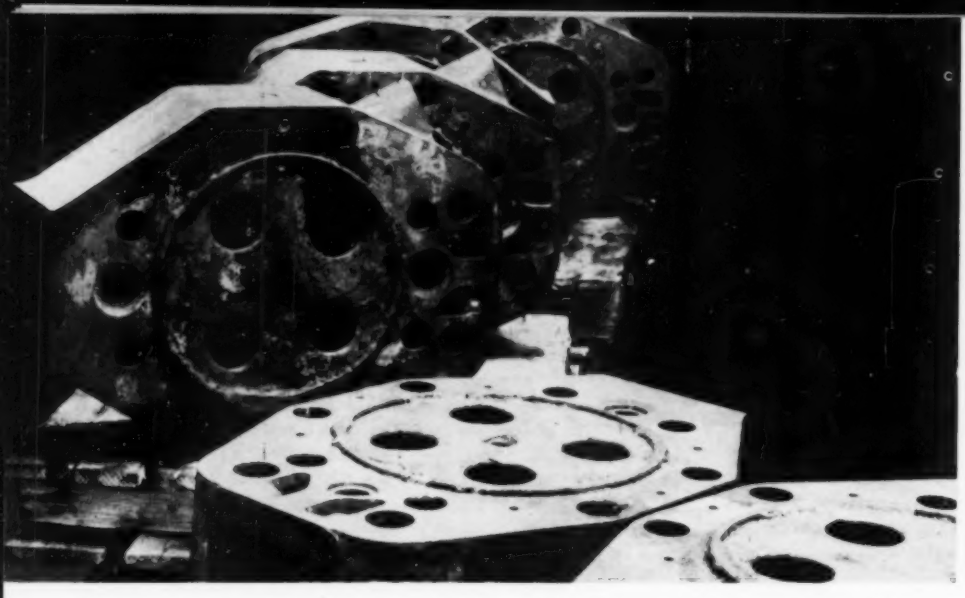
Shannon gin averages three bales an hour production, with the new engine providing power for three Lummus 80-saw stands; one boiler and cleaner; one hull extractor; three Mitchell cleaners and feeders; three 45-inch, one 40-inch and one 30-inch fan, and the baling press. Another stand and 45-inch fan are to be added this year, and the 180-hp diesel is expected to handle the entire load, according to W. E. Trammel, foreman.

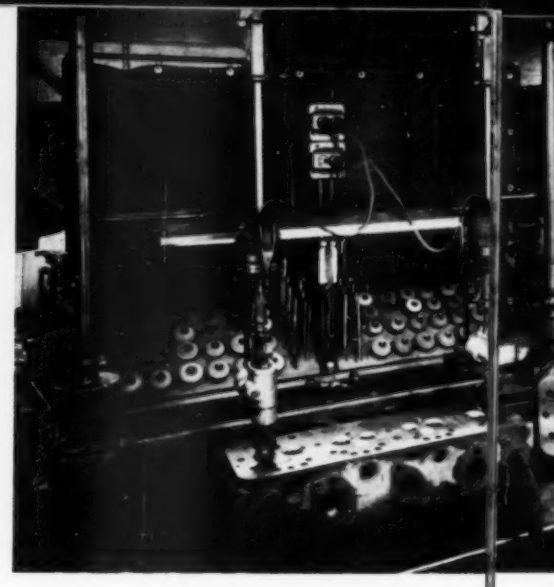
The Square Deal plant has a reported average hourly production of five bales. There, the equipment load includes four 80-saw stands; four Mitchell-Fisher extractor cleaners; two 30-inch fans; a 45-inch and a 40-inch blower, and the baling press. At the Bledso gin, production averages three bales an hour; equipment includes four 80-saw Hardwicke-Etter stands; two 40- and one 35-inch fans; three cleaners; burr separator, and baling press.

Once again the versatile diesel is proving its worth as a reliable and economical source of power in yet another industry. Its suitability for use in modern cotton ginning operations has been amply shown and owners have found that the lower cost per bale has amply justified the purchase. The new diesels mentioned in this article are International's UD-24 rated at 180 horsepower at 1575 rpm.

Cost-cutting diesel operating at McCartney Mercantile Company, Newport, Arkansas. International diesel shown operates three 80-saw stands and modern auxiliary cleaning equipment.







Diesel cylinder heads after being welded, built up and heat-treated. These are now ready for complete machining.

METHOD OF REBUILDING DIESEL CYLINDER

By ALFRED A. DECICCO

CRACKED cylinder heads mean costly tie-ups, operational loss of equipment for a considerable length of time, in short, a constant headache to owners of diesel engined equipment. There has been a considerable amount of thought applied to the problem of cracked cylinder heads and there are several causes of this type of breakdown in the diesel engine.

First, there are many more diesel units in operation in this country at the present and with more units in operation, it naturally follows that there will be more breakdown of this nature in diesel engined equipment. Secondly, due to increased load conditions, many units are operating at or even above full rating, with the result that increased strains and stresses are being put on the units.

The constant heating and cooling of the cylinder head will many times cause valve seat inserts to loosen which leads to cracking of the metal under and next to the insert. Many operators have arrived at the conclusion that cracked cylinder heads are due to the growth of the iron itself, because iron does grow when subjected to heat and of course the zone around the valves and spray nozzles does get the most heat and sometimes the least cooling.

These conditions all play an important part and have their effects in daily operation of diesel units. Experience has shown that when a diesel cylinder head cracks, it is far better to completely rebuild it rather than merely repair the cracks. The cost of repairing as against that of rebuilding represents only a small difference but on the other hand there is far greater ultimate economy if the head is rebuilt as this will eliminate the possibility of future breakdowns, which would be far more costly.

Ralph Stark, Incorporated of Long Island City, New York, uses the pre-heat fusion welding method in completely rebuilding all cracked cylinder heads. This company has a complete specialized service for practically all types of diesel cylinder heads, including heads from heavy-duty and railroad locomotive diesel engines.

For seventeen years Ralph Stark, Inc., have serviced diesel engines from coast to coast and now have reached some of the Central American trade. Sugar plantations located in the Canal Zone and around the northern part of South America, where a great deal of diesel engined equipment is in use, have sent Ralph Stark, Inc., as many as twenty-five cylinder heads in one shipment to be rebuilt. Diesel engines are of great value to those plantations who depend on their equipment throughout the year. In a visit to the Ralph Stark, Inc., plant one will find that the first step in rebuilding the cracked cylinder head starts with the stripping department. Here, all parts such as studs, valve guides, inserts, etc., are removed right down to the bare casting. Each head is then placed in batches according to type which proceed through the various steps. In this way production methods can be used at every step for greatest efficiency and economy.

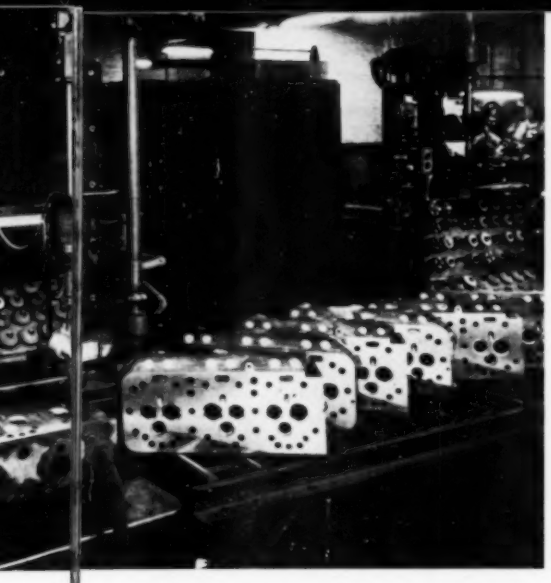
The second stage of the rebuilding process is preparation wherein burned and fatigued metal around all the valve seats is machined away and the head completely checked over for all necessary repairs.

Next the heads are sent to the Welding department and each type of head is preheated in ovens specially designed for the particular characteristics of the cracked head. These precision regulated ovens prevent internal strains and stresses and insure perfect fusion. The ovens are engineered and built by the Ralph Stark, Inc., organization since they are not otherwise available for purchase.

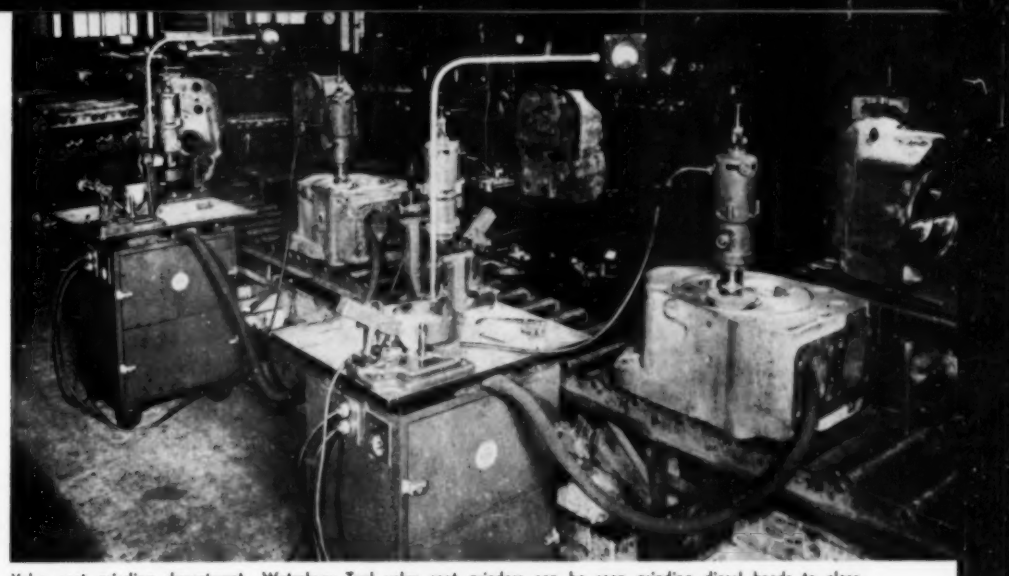
While the head is in the pre-heating oven, all cracks are thoroughly welded by men outfitted in asbestos protectors. An opening in this oven enables the men to get at every part of the head to weld and still have the cracked heads heated. All the valve seats are built up with extra tough Chrome-Nickel alloy. By this method the use of valve seat inserts is completely eliminated but all the advantages of an insert are retained resulting in a better cylinder head. It is claimed that metallurgical tests have proven this alloy to produce valve seats harder and more durable than the original metal. After welding and building up the complete head, it is then heat-treated and normalized for extra long life.

After the welding operation the heads are then hydro-statically pressure tested. This is done by filling the water jacket with a specially thin chemical liquid and then applying 100 pounds of air pressure. If any leaks are detected the heads are returned to the welding department for re-welding.

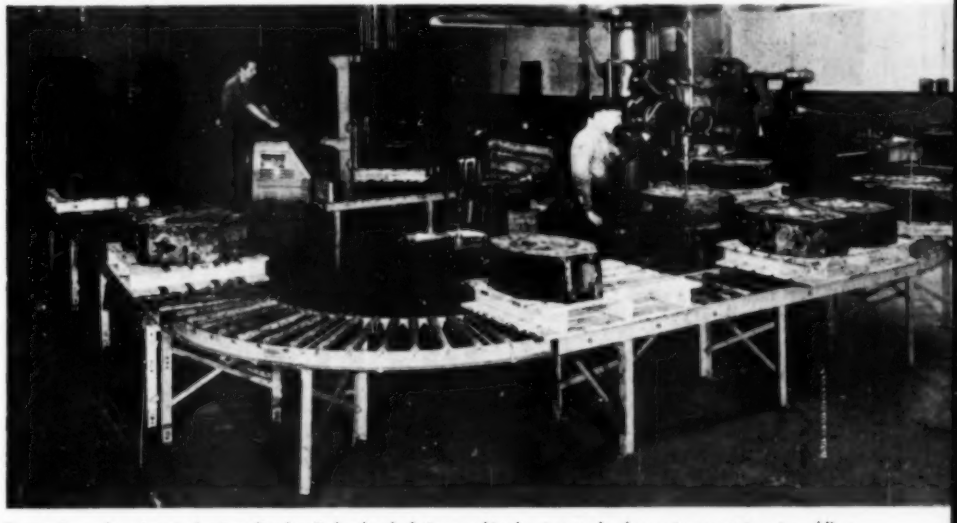
Following testing the heads are resurfaced on



Grinding valve seats in diesel heads after they have been completely rebuilt. The use of production grinding equipment is important for quick and efficient work.

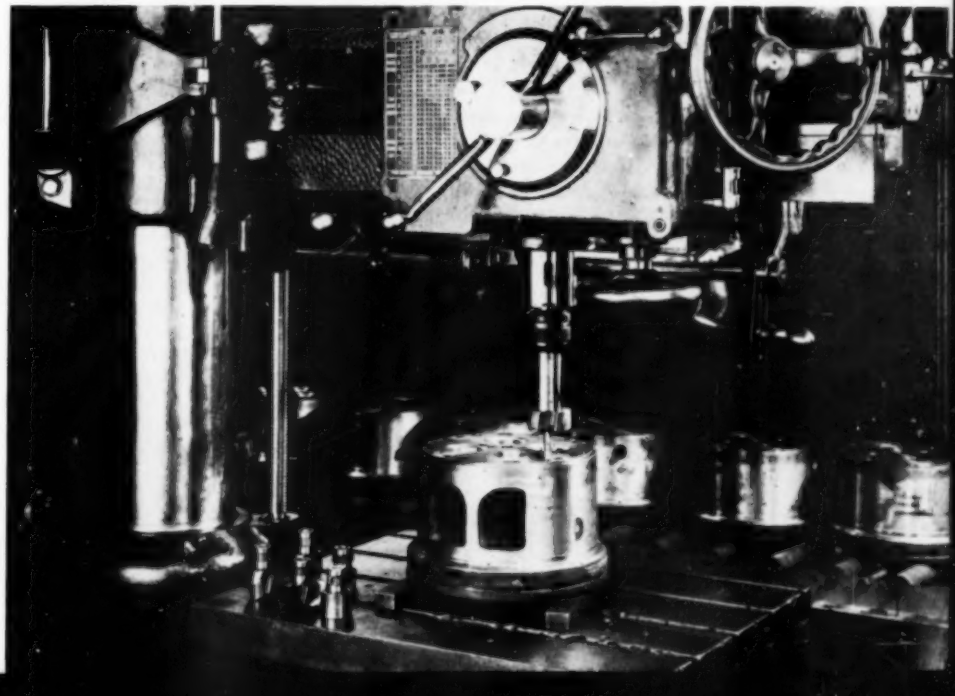


Valve seat grinding department. Waterbury Tool valve seat grinders can be seen grinding diesel heads to close tolerances.



Preparation department showing diesel cylinder heads being machined out around valve seats preparatory to welding and rebuilding.

Machining built up valve seats in cylinder heads using cutters and other machine tool equipment designed primarily for this work.



HEADS

precision surface grinders which remove all roughness leaving a factory finish.

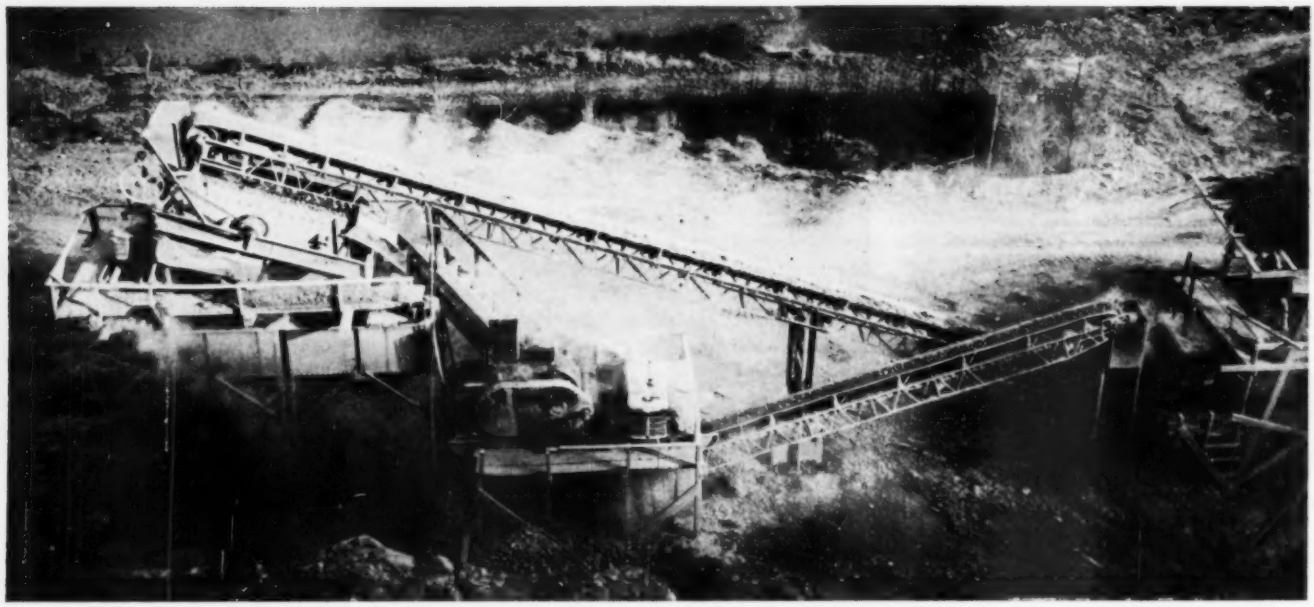
The next operation is machining the valve seats to original factory specifications. This is done by using carbide tipped cutters precision ground for each of the valve seat dimensions. After this operation the heads are again hydro-statically pressure tested as mentioned above.

Then the built up and machined valve seats are ground to closest accuracy with Waterbury Tool valve seat grinders, all stud holes are retapped and the head checked from end to end. Ralph Stark, Inc., has on hand 12 Waterbury Tool grinders to take care of all its valve seat grinding.

Rebuilding of the precombustion or injector nozzle opening, is one of the important operations that requires highest skill and precision for proper injector operation when the head is in use. In those type of heads where a copper injector tube is used new tubes are installed and carefully machined. On other types, the injector opening is filled in solid by building up, and is then machined to original specifications.

As will be noted this rebuilding process entirely eliminates the use of valve seat inserts but retains all of its long wearing advantages through the use of Chrome-Nickel alloy in building up all the valve seats.

Fusion welding has been accepted by many metallurgists as the strongest process for welding machinery, but the steps and care taken during this process are what count.



Bee Rock Quarry crushing installation. Three International diesels can be seen—unit to the right operating jaw crusher, center engine running secondary crushing unit and upper left, the third engine for the screen and longer conveyor.

DIESELS WRING ROAD MATERIAL FROM "BEE ROCK" BLUFFS

DIESEL power in an historic setting is playing a vital part in bringing better roads to White County, Arkansas, where county officials have cut their costs for crushed road stone in half by reopening an old quarry of 19th century fame. The new installation is producing road topping from ages-old sandstone along the Little Red River, described 90 years ago as the outstanding geological feature of the area.

Modern crushing equipment, powered by three diesel engines, was installed last May at old Bee Rock Quarry, on the river bank near Searcy, in an attempt by the county to obtain cheaper road material and stretch its highway improvement dollars. In the past, the high cost of stone, which was trucked in 60 miles from Little Rock, was a major hindrance to improvement of local highways.

Only 350 of the 3,500 miles of county road were topped with stone or gravel up to last May. Now operations at Bee Rock Quarry produce the necessary stone at half the cost, permitting budget dollars to go twice as far and speeding the road-surfacing program. Formerly, it cost approximately $3.00 overall to put a ton of stone on the road. Today, with the material from the county plant, the cost has been reduced to approximately $2.00 per 2,700-pound yard, or $1.48 a ton.

The old quarry takes its name from the famed "Bee" rock of the sandstone cliffs overlooking the Little Red River, long a landmark of the region. These are described in detail in the State publication of 1858, "First Report of a Geological Reconnaissance of the Northern Counties of Arkansas," printed by Johnson & Yerkes of Little Rock, State printers of that time.

In the 19th century this stone was supplied to Memphis, Tenn., as building block by Bee Rock Quarry. The quarry was closed in the late 1860's, and remained idle, except for a brief period of operation by the Federal Government during the first World War, until last May.

During the seven months of operation, May to December, last year, the plant produced 24,000 yards of crushed stone, an average of 170 yards a day. This production rate was much lower than had been anticipated. The sandstone proved to be very hard, and had to be fed to the crusher in large pieces—some almost man-size—which caused difficulty in handling and slowed operations. More efficient methods of handling the stone were developed by the operators, and by last December the production rate had been increased to an average of 300-400 yards of 1½-inch "road material" per eight-hour day. The primary crusher was set to reduce the sandstone to 3-inch size, and the secondary to 1½-inch.

The county installation uses 265 diesel horsepower. Primary unit is a 20 x 36 jaw crusher, pulled by a 100-horsepower diesel, which also supplies power for the feeder. A 40 x 22 roll crusher, the secondary installation, and a 24-inch by 35-foot conveyor, are driven by a 125-horsepower diesel. The 4 x 12-foot screen and a 90-foot by 30-inch conveyor are operated by a diesel of 40 horsepower.

Most of the stone produced at Bee Rock quarry from last May to December was used for emergency patching of roads. In addition, 16 miles of road were newly topped. An expanded program of road surfacing is scheduled for this year. Resumption of quarrying on "Bee" rock has also benefited the State highway department and private contractors of the area. They are able to buy the crushed stone from the county for use in building and on State roads.

Through modern diesel power teamed with tough crushing equipment, White County's "romantic scenery" now contributes in an unusual way to the development of 20th century travel facilities there.

Little did David Dale Owen, geologist of the 1858 survey think that the region he described would be the scene of such mechanized activity when he wrote, "The most conspicuous geological feature of this country is the escarpment of sandstone along the bluffs of the Little Red River known as the "Bee" rock.

The diesel engines used in this interesting quarrying operation are from International Harvester with Pioneer crushing equipment.

DIESEL ENGINED TRAWLER

By DOUGLAS SHEARING

RE-ENGINED and refurbished from stem to stern, the steel trawler *Gudrun* recently sailed from Boston for her sea trials which she passed with flying colors. Named after Captain Axel Johannsson's pretty 10-year-old daughter, Gudrun is now rated one of the best and most efficient trawlers operating out of Boston harbor despite being a twenty-two-year-old boat. It has been estimated that with an approximately doubled working life, the cost of reconditioning plus the installation of new machinery was less than one third of today's cost for a new trawler of equivalent size and power.

The *Gudrun* is a big and powerful boat, built at the Bath Iron Works, Bath, Maine, in 1928. She was then known as the *Boston College*, and was owned by Frank O'Hara. During World War II, she was taken over by the Navy for special duties. When she was acquired by Gudrun, Inc., headed by Captain Johannsson, her original 500-hp. engine was found to be inadequate for proceeding to and from the fishing grounds. Consequently a new engine was installed. This new unit, is a two-cycle, 12-cylinder, 1,000-hp. diesel.

Pilot house control of the propulsion machinery gives the helmsman complete control of maneuvering the ship—a valuable feature if trawl lines are to be kept free of fouling the propeller. At the same time as the engine was installed, the entire vessel was overhauled and the electric trawl winch gear was reconstructed from designs by the electrical department of the engine builder.

The *Gudrun* is 115 feet long, by 23-foot beam and 13-foot draft, and her new main engine drives the propeller through a 2.28 to 1 reduction gear. In winter, she spends from eight to twelve days at sea before returning to port with her catch, and from six to nine days during the warmer months. She goes as far as two-and-a-half-days' run from Boston, according to where the fish are running, and has a capacity of 150 tons of iced fish. Mostly haddock is fished for, as the average price for it is higher and more stable than for other East Coast fish. After the fish are hauled aboard, they are gutted, washed and packed in ice, ready for delivery at the Boston fish pier.

The new engine has increased her speed considerably, even without using maximum revolutions and power. This is pleasing to the crew, some of whom are also stockholders in the holding company. They get 60% of the take, compared with the Captain's 40%. They pay for the fuel oil and food, plus certain contributions towards the wages of the cook and engineers. Dependability of the engine, too, means much to these toilers of the deep. There are twelve men, a mate, chief engineer, assistant engineer and cook, besides the skipper. Watches are six hours on and six hours off duty. Danny Meagher is chief engineer, and James Clements is his assistant.

The reconstruction and redesigning of her old trawl winch was an important step towards efficient operation as, when fishing, the trawl is raised and lowered at least every one-and-a-half hours, and sometimes every few minutes. The winch motor, with the power transmission to the winch on the forward deck, is located on a flat in the forward part of the engine room.

The engine room, itself, is completely equipped. In addition to the new diesel main engine, two auxiliary diesels have been installed. One generator set is for the trawl winch power, and the other unit for ship's service. The winch generator can also be used for ship's services if needed. This generator is of 110 volts at 800 r.p.m., or 240 volts at 1,200 r.p.m. These two auxiliary diesel generator sets are located on the starboard and port sides, respectively.

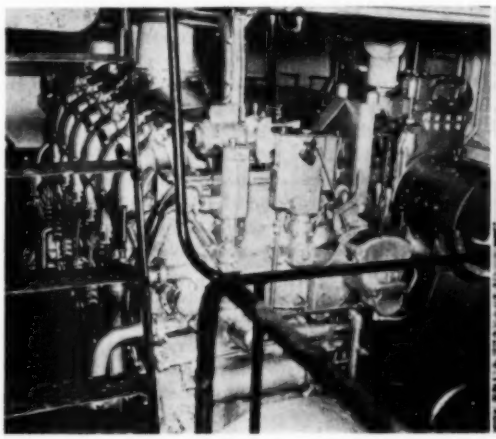
Forward of the larger generator set is the emergency fresh water pump, the filter for the main engine lube oil, and the fuel oil day tank which takes its supply from the cross bunker located just ahead of the machinery space. The fuel oil transfer pump also is at the forward end of the engine room. A new emergency bilge pump has been installed on the after-starboard side, near the main bilge pump and suction manifold. For fish-washing operations, a new pump has been installed on the port side of the engine room, adjacent to the 200-psi. air compressor for the main engine starting supply, and for the ship's siren. Starting air tanks are located on the port side, as are the electric storage batteries and switchboard. A work bench is forward, while the ship's heating boiler is located at the after end of this compartment.

Accommodation is provided for in the way of a large forecastle to sleep twelve men, and four cabins aft, each with wash basin. One of the cabins has two berths. The captain's cabin is aft of the pilot house, as is customary. There is a large combination galley and mess room with oil-fired range and other usual equipment.

A run of nearly 100 miles was made on the trial trip, and more than an hour was spent dropping the trawl net some 300 feet to the bottom in deep water, and then trawling. Several hundred fish were caught in this short time, including red-fish, haddock, herring, flounder, shrimp, a moray eel, one shark, two skates and one weird-looking specimen.

The main diesel engine was furnished by Cleveland Diesel Engine Division of General Motors Corporation as was the auxiliary set for winch and ship's services. The other ship's service auxiliary generator set was supplied by Detroit Diesel Engine Division of General Motors Corp.

Engine room view showing General Motors diesels for propulsion and furnishing current for winch motor.



The *Gudrun* proceeding to sea from Boston harbor.

Exchange Your Diesel Maintenance Ideas

CONDUCTED BY R. L. GREGORY

Mechanical Insert Repairs For Diesel Engine Parts

DIESEL plant operators and maintenance crews are facing a serious problem today in their efforts to keep operating and maintenance costs down. The price of replacement parts seems to be continually on the rise which condition is reflected in increased operating costs and consequently resulting in diminishing profits.

Therefore it should be the objective of those operating such plants to be on the alert to new developments which will lower the maintenance cost of replacement parts. The larger items such as cylinder heads, piston heads, pistons, liners etc. are the items that really run into money when they have to be replaced.

Regardless of the amount of care and effort on the part of a maintenance crew or the watchfulness of operators in the method of operation and the conditions effecting operation, they occasionally run into a situation of cracked cylinder heads, liners, and even engine frames, the cause of which is at times a baffling problem to those in charge of the engine.

Yet these things do happen and replacements must be made and this means the expenditure of more money for maintenance. For several years past the industry has endeavored to salvage various of these more costly parts by various means, particularly by welding. Some degree of success has been obtained on this method of repair, but anyone having a knowledge of this type of repair, is conscious of the difficulties normally encountered in fusion welding or the brazing of large machine parts or sections of such parts, to say nothing of the cost of such repairs if effectively accomplished.

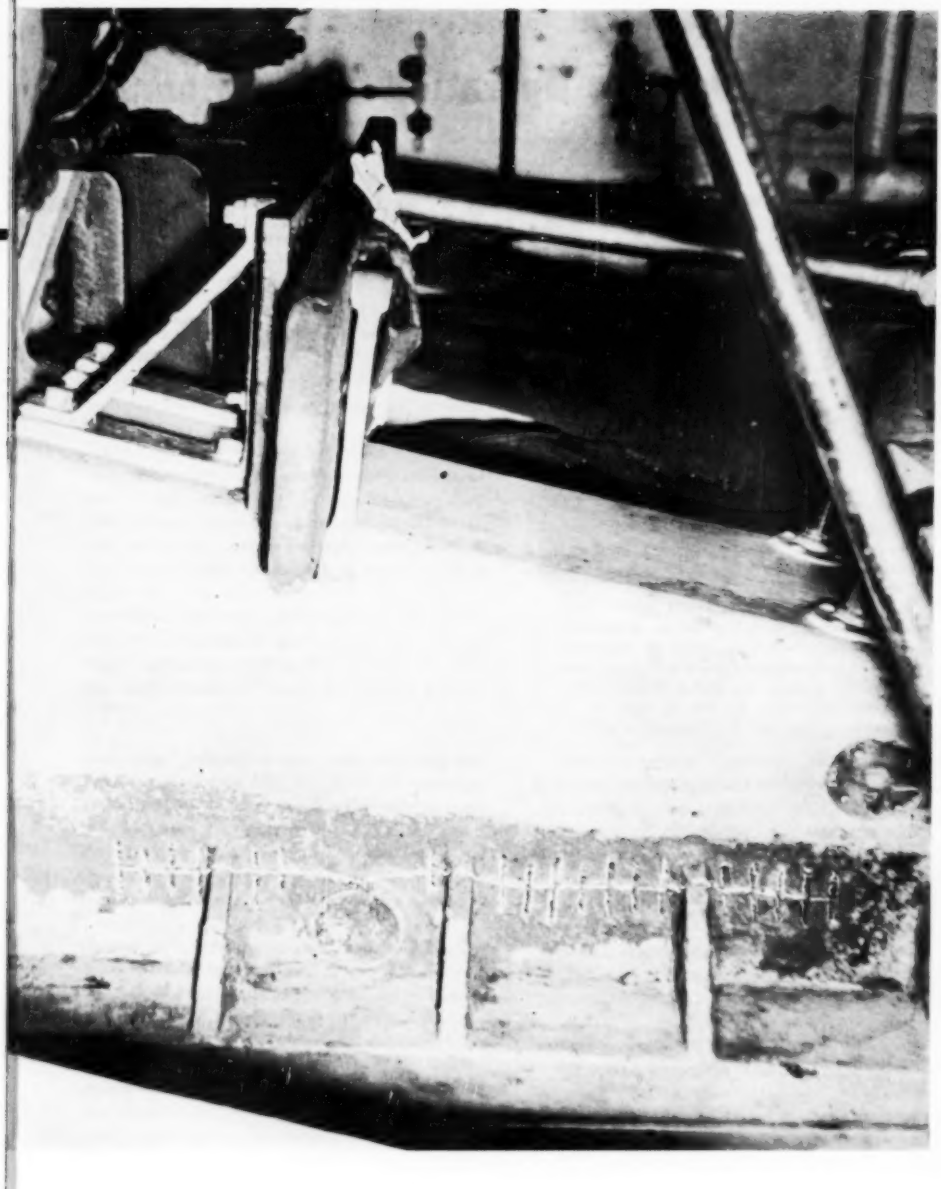
It is generally known that the tensile strength of all common metals is more or less enhanced by cold working and that it is frequently desirable to induce compressive stresses in a surface normally subjected to high tensile stress. This can be easily demonstrated by the improved fatigue resistance of any shaft after shot peening or cold rolling the surface. The technique of sealing against pressure by means of chaulking has been known as an emergency expedient for many years. Therefore it was with this fundamental knowledge, that these techniques were combined to form the basis of mechanical repair to such parts, thus overcoming the objectional features which are encountered in many instances by fusion methods.

The principal objectional feature is the necessity for preheating a large casting in order to relieve the tendency to crack due to thermal conditions, and the loss of physical properties of the metal because of uncontrolled cooling, and resultant warpage, especially in the welding of cast iron parts. Now do not misunderstand me as I do not mean to imply that such repairs cannot successfully be made by fusion welding. They can, but in so doing conditions must be right, proper equipment must be used and a lot of care exercised in the repair. However should some condition arise to change the procedure, a lot of effort, time and material has been lost, and high expense incurred.

With this thought in mind, several Diesel Supervisors of the writer's acquaintance have gone in for cold metal repair to such castings as cylinder heads, liners, frame repair etc. and in every instance they have agreed that the cylinder heads and liners which they had repaired by this method and were using as replacement parts were giving better service and longer life than the original castings. This is probably explained by the fact that any cylinder head, piston head or liner which has been used and then repaired is "seasoned." This fact makes it easier to work cold, and by omitting a preheating process, the parent metal is tougher having not been subjected to the conditions of preheating and cooling, this minimizing the possibility of warpage and other conditions resulting from preheating and cooling.

The accompanying cuts show three such repair jobs and will give the reader some idea of how the job is accomplished and what they look like when completed. Figure 1 shows a repair on a cracked Diesel frame. Note that the vertical crack has been repaired by this method, which consisted of a series of slots drilled at right angles to the crack and about two inches apart. A special steel bar (36 percent nickle steel), an alloy known as metaloy is used to plug this slot. This bar is shaped in conformity with the slot, having indentures to fit the irregular sides of the slot and is worked into the slot by the cold method. These bars are hammered down in the slot with special tools, one on top of the other until the slot is completely filled, leaving a slight amount above the original surface of the casting for final dressing of the part.

Now of course the size and number of the prepared slots, their depth and length, depend wholly upon the nature of the crack, the properties and thickness of the parent metal. The alloy used to plug this slot was selected because of its cold working properties. In working it, it hardens



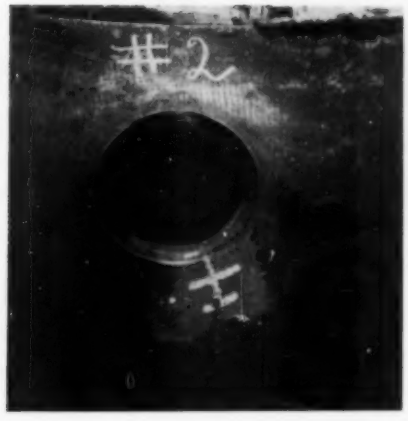
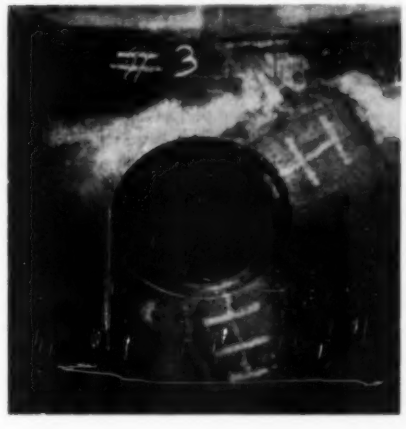


Figure 2, above: Repair on cracked relief valve port of cylinder liner.

Figure 1, left: Repair on a cracked frame.

Figure 3, below: Repair on cylinder liner air port. Note two cracks repaired.



slowly from the fully annealed condition to a strength of approximately 140,000 psi. This material retains good mechanical properties throughout the range of cold working. The low coefficient of expansion of (0.4 x 106) per degree F. is typical of this type of alloy and is of extreme significance in repairs to equipment operating at elevated temperatures. The cold working properties enables the material to be worked into the irregular indentures and crevices of the parent metal to effect a sound pressure tight joint.

In the process of working the alloy metal bars into the parent metal, the metal surrounding the repair is upset and a residual pre-stress in compression results. This prestressing of the parent metal in compression with the subsequent prestressing of the repair metal in tension has a two fold advantage. The former condition precludes failure of the parent metal across the ends of the locks until the external load is sufficient to relieve the compression stresses and cause the parent metal to fail in tension. The prestressed repair metal will not stretch and allow the joint to loosen until the external load stresses this repair metal in excess of the initial prestress.

Figure 2 shows a repair made by this process on a cracked relief valve port of a cylinder liner. This crack was 2½ inches long and being a smaller repair job the horizontal lines are closer together than in the Figure 1 repair on the frame. Figure 3 shows a similar repair on a cylinder liner air port in which there were two cracks. The shorter one being 2 9/16" long and the longer one 3 9/32" long. You will note that after the horizontal repair had been made that the crack itself was slotted and inserts worked into place.

One can readily see that with this type of repair and the surface of the inserts ground off to the surface of the parent metal, that you would have an excellent repair job. The nice feature of the job is, that the repaired casting in many instances has outlived a new casting, the cost of such a repair being considerably less than a new casting, thus cutting down on maintenance costs. Such a repair also excludes the necessity of any machine work on the casting. Experiences with this type of repair have proved most satisfactory to many Diesel Maintenance crews and after all that is what we are working for, a lowering of maintenance and replacement costs.

High-Speed Diesels . . . Design, Operation & Maintenance

CONDUCTED BY H. G. SMITH

Cylinder Head Gaskets

Cylinder head gaskets are not very frequently discussed because they don't give too much trouble if the design is correct.

They are however, very vital to good engine operation and it is essential that a full understanding of their duties be understood.

Space will not permit going into all details of the various constructions used and the reasons for some of the peculiar designs. There are many different types and shapes but the most commonly used design is the one with copper sheets on each side of a prepared and bonded asbestos. This type is by no means considered the only successful type because steel sheets are used in many high duty gaskets and several are made of soft annealed copper sheets without any asbestos filler.

On engines up to around 300 to 400 horsepower the gasket is usually of a flat design placed between the flat surface of the cylinder head and the top of the cylinder block. On some larger engines, where the cylinder head is individual for each cylinder, plain steel and tin rings are used set in recesses to shield them from the blast of the combustion flame and high temperatures.

All engineers do not agree that one or the other type is the best, Experience has taught them to use a certain type for their engines and they continue to follow the same type on their entire line of engines. During the last war when copper was scarce and restrictions were placed on its end use, the gasket manufacturers were compelled to use many substitutions and this did result in many failures.

To understand what a cylinder head gasket must do it is necessary to study in detail what it is expected to do and what are the surrounding conditions both when the engine is running as well as standing idle.

It must (1) withstand a flame around 1800° Fahrenheit temperature, (2) seal the oil and water openings between the cylinder head and block, (3) expand and contract with the change of cylinder head bolt tension, (4) withstand the maximum combustion pressure and (5) hold down the cylinder wet liners if they are used.

Items number one (1) and three (3) are the most troublesome. It is the general consensus that a cylinder head gasket on a diesel engine has more to do than one on a gasoline engine because the diesel has a much higher compression and firing pressure. Under ordinary operating conditions this is true but I would like to cite a case where the gasoline engine failed whereas the diesel did not.

H. G. Smith's background in diesel engineering renders his articles of great interest to those engaged in operation and maintenance of high-speed engines. From the Springfield, Ohio, Technical and Engineering school, he entered the Foos Gas Engine Company, Springfield and later, Springfield Motor Truck. With this experience behind him, he joined Hercules Motors Corporation where he was chief engineer for many years being with them when their diesel program was started. Executive engineer for Buda during the last ten years, he recently resigned to take up consulting work.

A small over head design engine was built to operate either as a diesel or a gasoline. Different manifolding and cylinder heads were used when operated as one or the other but the cylinder head gasket was the same for both.

The diesel as well as the gasoline engines had been produced for some time, both having passed through the usual laboratory and life tests, and they were quite successful in the field. The gasoline engine was installed in a farm tractor and several hundred had been placed in service.

Complaints were reported of the cylinder head gaskets blowing out and the conditions became quite serious.

The design of the gasket, its construction, bolt spacing, installation, etc., were studied again. All known complaints were tabulated, listing the geographic location of the tractor, the length of service and actual work being performed.

Returned gaskets were collected to determine the *pattern* of the failure. It was found that every gasket was failing around the combustion chamber grommet on the opposite side from the spark plug location.

This could be caused by one of three things or all. Too high compression (for the fuel used), lack of turbulence in the combustion chamber or lean mixture. Studying the reports coming in from the field revealed that the users were greatly pleased with the fuel consumption, in fact, they were so much better than that obtained with other tractors that it became a major topic of discussion between the farmers.

The failures plus the low fuel consumption reports tied in together. Since the engines had successfully passed the laboratory tests without any gasket failures being recorded it was obvious that something was being done with these tractor engines that must be found out immediately.

The field engineers found that the carburetor had an adjustment which would permit leaning down the mixture. The field setting was duplicated in the laboratory and the answer was found immediately.

The laboratory tests proved that the engine had an unusually good manifold distribution resulting in excellent combustion and it would operate and produce its power with an unusually low fuel consumption. The tractor operators found this out and cut down the fuel not realizing what damage it would cause.

They didn't know that, combined with high compression, low octane fuel and lean mixture, a hot zone was produced when the last part of the mixture burned. The failures of the gaskets disappeared when the mixture was raised.

No trouble was experienced with the same gasket when the engine was operated as a diesel but under a specific condition as outlined below some difficulty could be expected.

Diesel engines are subject to lean mixtures and if operated continually under these conditions, valve failures or burning might occur as well as gasket burning. Lean mixtures occur when the engine is operated under light or partial loads.

The air supply to the cylinders is constant because the air is not throttled, the fuel is the only thing that varies when part load operation is used, consequently the fuel air ratio goes up. This means that the mixture will burn a lot hotter because of the excess air and if continued for any great length of time the valves and gaskets may become burned. For this reason it is better to keep the diesel engine as close to full load as possible.

There have been cases, where even the top of the pistons will burn out. In one installation where the engine was to operate on crude oil the operator thought that by cutting down the load he

could get better life from the engine. It was a constant speed oil field installation where the condition was the same hour after hour. After many failures of pistons, rings, valves and gaskets the load was increased and the failures then disappeared.

Item number (3) previously listed as "Expansion and contraction of cylinder head studs" with the corresponding tension of the stud nuts, is also a very serious problem especially on High Speed Diesel Engines. The proper torqueing of these nuts can only be determined by calculation supplemented by laboratory tests.

They must be tightened sufficiently to keep the head and gasket tight but not too tight where it will distort the cylinder head.

This becomes a very serious problem where aluminum cylinder heads or cylinder blocks are used. The studs expand slower than the aluminum and they have a tendency to compress the head bosses. This condition is all right and does tighten the gasket under operation, but, since the stud bosses are compressed or shortened the stud nuts will be loose when the engine cools off. After heating up and cooling off several times you will find that the nuts are loose and a gasket failure could occur.

Aluminum heads are not yet used very extensively but the same thing happens with the cast iron heads but not to the same degree. It is a condition that exists; therefore, don't forget that your cylinder head gasket failure may be caused by not following the torqueing of the nuts recommended by the manufacturer.

As for the designing engineer, don't feel satisfied with your design until you have exhaustively studied your stud spacing, size of studs, proper grommets around the combustion chamber, water holes and oil passages. Don't take chances with small studs or wide spacing because you will regret it sooner or later. Consult a good gasket manufacturer before the design is finished. Nine times out of ten he will keep you out of trouble if you accept his recommendations.

Although high unit pressure is desirable be careful to give sufficient width to allow space for the asbestos.

Many engine manufacturers grind the mating surfaces of the cylinder head and cylinder block so as to provide a smooth contact for the gasket and to permit even distribution of the pressure. The gasket manufacturer has developed a thin coating which is applied to each side of the gasket. This has been done to provide a good seal even though the surfaces might be slightly scratched.

It is not a good practice to use a heavy or thick coating of any gasket cement, because any bumps or uneven coating will cause uneven pressure which will cause failures. The gasket can only radiate its heat through good contact and thick uneven coatings set up a dam and prevent the proper heat transfer.

Greater Life Expectancy Since Conversion to Diesel

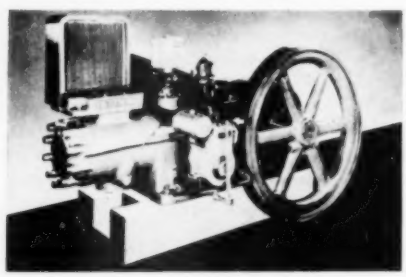
A LONGER life and greater usefulness are assured to vessels repowered with diesel engines. A notable example is found in the towboat *Maine*, a wooden-hull vessel built in 1917 and formerly the *Socony No. 3*, which recently was converted from steam to GM diesel gear drive. The registered dimensions of the *Maine* are 97.8 ft. length by 25 ft. breadth and 11.2 ft. depth, 175 gross ton and 119 net ton. Original equipment included a 600-hp. steam engine turning a 104-in. diameter, 4-blade, cast-steel propeller at 110-115 rpm. on a 7½-inch steel shaft.

The Cleveland Diesel Engine Division of General Motors Corporation furnished through their New England distributors, one of their twelve-cylinder, V-type diesel engines, rated 900 hp. at 750 rpm., and equipped with airflex clutch-reverse-reduction gear unit. Also furnished were the customary air-starting tanks, electric motor-driven compressor units, and the necessary coolers, filters and exhaust muffler.

A Balanced Pressure Seal

THE Sealol Corporation has on the market, a seal shaft ring that is used for leak-proof contact between stationary and revolving parts. *Sealol* is a face type seal that is also used for rotating shafts. Initial contact between sealing surfaces is maintained by a light spring pressure. The fluid being sealed acts on two opposing surfaces, one slightly larger than the other. *Sealol* seal is capable of handling pressures in excess of 1000 psi., surface speeds in excess of 10,000 FPM., and temperatures as high as 500°F.

Two New Horizontal Engines



Lorain Model R and Model A Engines

DEVELOPMENT of two new horizontal type single-cylinder, two-cycle engines is announced by the White-Roth Machine Corporation. Designated as the Lorain Model R and Model A engines, the units are in quantity production and available for short-time delivery.

Both engines are identical except for cylinder bore and brake horsepower output. The Lorain Model R engine with 12" bore and 13" stroke, produces 45 bhp at 325 rpm; the Model A with 13" bore and stroke, produces 55 bhp at the same speed.

Designed as companion power plants to the well-known line of Lorain L and O engines, both new models have tapered roller bearing crankshafts and auxiliary shafts. Wet-sleeve cylinder liners of alloy cast iron assure long life and easy replacement on location. The manufacturer states that this construction eliminates costly reboring and engine down time.

The Lorain Model R engine operates on natural gas fuel only. Model A can be operated as a cold-starting, full diesel or converted to burn natural gas or butane. Conversion is quickly accomplished in the field.

Condenser type cooling system eliminates the need for a water pump and make-up water is negligible. Standard equipment includes Twin Disc Clutch, Pierce Governor, Air Maze oil-bath cleaner, McCord Lubricator, and built in 7½ hp Lorain gasoline starter.

G.M.'s F. G. Shoemaker on Torque Converters

F. G. Shoemaker

A REVOLUTIONARY change in the arrangement and method of operation of many types of power machinery as the result of a far wider use of torque converters is predicted by F. G. Shoemaker, consulting engineer of the Detroit Diesel Engine Division of General Motors.

The torque converter, which is a form of hydraulic transmission automatically adjusting the output of the engine to the task at hand, contributed to the successful performance of tanks, tank destroyers and other heavy-duty mobile equipment during Warld War II and has since become popular on Buick automobiles.

Mr. Shoemaker believes that we may expect to see machines with an almost human conception of motion as a result of the versatility made possible by further application of the torque converter. He predicts that power shovels might be designed to use the same circular type of motion as a real man employing a hand shovel instead of scooping up earth and rocks with straight angular motions like a robot or mechanical man.

Vice-President in Charge Engineering

Jules P. Kovacs

JULES P. KOVACS, chief engineer of Purolator Products, Inc., Newark, New Jersey, manufacturer of automotive oil filters and other filtration equipment, has been elected vice-president in charge of engineering, Ralph R. Layte, president of the company, announced today (Thursday, October 6).

Mr. Kovacs joined Purolator as a design engineer in 1929, after studies at Newark Technological Institute and Newark College of Engineering, and design work with Westinghouse Electric, Standard Oil Development, Durant Motors, Hyatt Bearing and Wright Aeronautical Corp. He was appointed chief engineer at Purolator in 1941.

Born in Buffalo, New York, and a resident of Maplewood, New Jersey, Mr. Kovacs holds several important hydraulic patents and is applicant for others. He is a member of the Committee on Hydraulic Equipment, Society of Automotive Engineers; Technical Advisory Committee on Hydraulic to the Armed Services; the Coordinating Research Council; the Technical Association of the Pulp and Paper Industry; the American Society of Lubricating Engineers; the English Speaking Union, and numerous hydraulics standardization committees.

Stainless Steel Piston Rings

STAINLESS steel, which maintains tension under excessive temperatures and is corrosion resistant, is the metal employed in a new series of "Non-Breakable" piston rings announced by The Steel or Bronze Piston Ring Company, Indianapolis 25, Indiana.

In addition to being free from distortion, the rings are said to reduce friction and wear by providing a "dissimilar" metal for the "rubbing" surfaces and to increase compression efficiency by a near-constant expansion factor which permits closer tolerances between ring and cylinder wall.

The new stainless rings are manufactured by forming from "open-end" metal to true circle proportions and heat-treated in that shape with techniques developed through thirty years of pioneering "non-breakable" steel or bronze rings. All rings are ground on the O.D. and are lapped on the sides to provide perfect seating and eliminate "sloppiness" in the piston grooves. This lapping also permits two rings to be employed in the same ring grooves where experience indicates this produces maximum efficiency (two $\frac{1}{8}$ in. rings, for example, are used on the plunger of the die casting machines with $\frac{1}{4}$ in. grooves).

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You expect dependable service from Diesel engine castings—of course—and you get it when they're made by N-B-M. All our facilities are directed to the production of parts that give longer, better, more economical service. These facilities are complete from engineering, through production to final inspection.

We can furnish bronze castings in any size . . . any shape . . . any degree of finish you require. The very latest in foundry techniques and equipment insure fine grain and closeness-to-size. So, whether your problem involves a complete design and engineering service, or simply castings produced to your specifications, let N-B-M furnish you with quotations on your next casting job!

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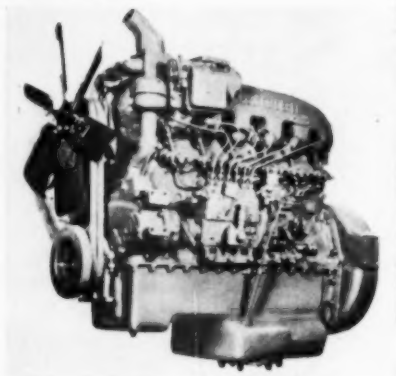
Manitou and Pike's Peak Get Two New G-E Diesel-Electric Locomotives

STEAM power will disappear almost completely from the famous "railroad to the sky," the Manitou and Pike's Peak Railroad, when two new diesel-electric locomotives enter service next year. Recently ordered from General Electric, the 400-hp. locomotives are specially-built units similar to two G-E locomotives now in service on the cog-road.

The old tilt-boiler steamers, familiar to hundreds of thousands of tourists, are now used only when sight-seeing traffic becomes very heavy on the 14,000-foot ascent up Pike's Peak. When the two new units go into service the steamers will be used only to drive the snow plows to open the road in the spring and as stand-by equipment on extra-large party trips.

Experience with the original G-E diesel electrics in service has shown a time advantage of a half an hour per round trip over the old steamers. Maintenance cost, always a big item in railroads in this class, has been cut 30 per cent, while fuel expense has been cut approximately 27 per cent in comparison with the steamers. Similar savings are anticipated by the railroad from the use of the two new diesel-electrics.

High-Speed, Heavy Duty Diesel Trucks



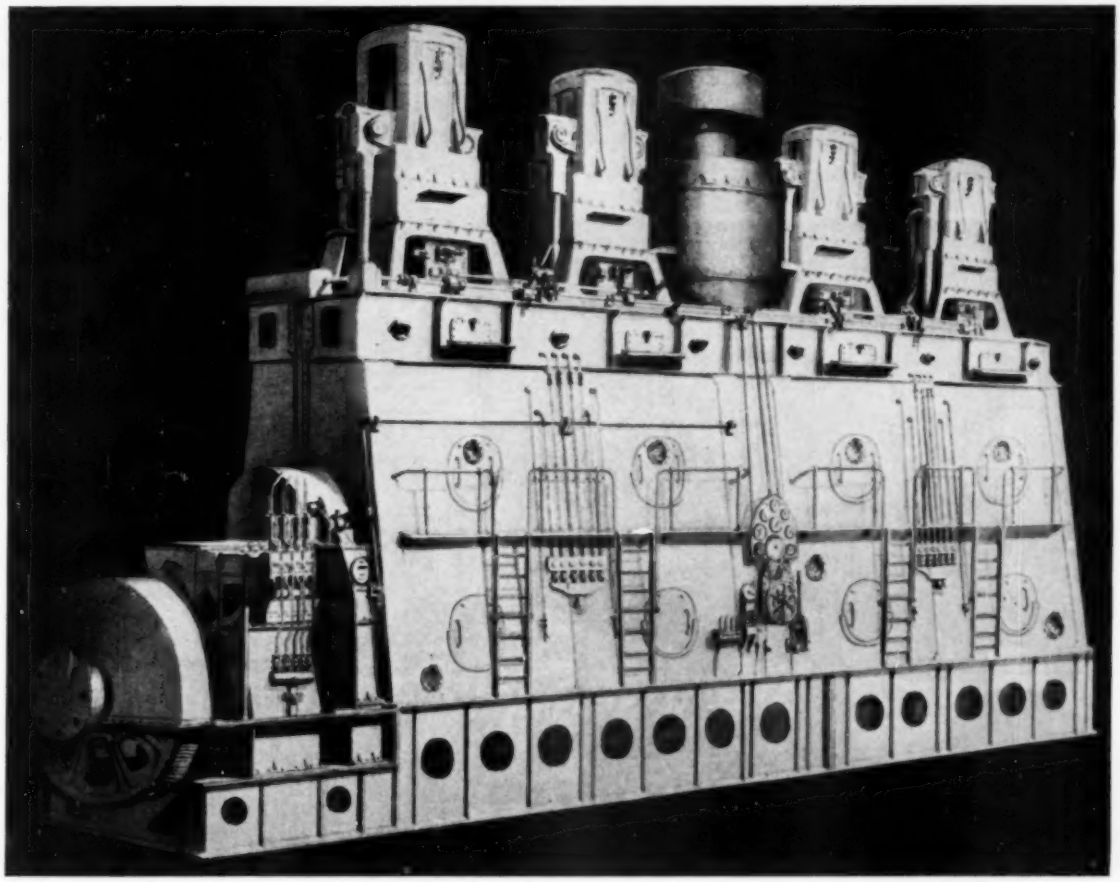
TWO new high speed heavy duty diesel series trucks comprising five models in the medium price field of both conventional and six-wheeler design have been introduced by the Federal Motor Truck Company.

Production is already underway on the new D45 and D645 diesel series. All of the diesel models will be powered with a light weight, high speed heavy duty Hercules diesel engine with a 4¼ in. bore and 5 in. stroke and a piston displacement of 426 cu. in. The engine develops 142 horsepower at 2600 rpm. and has a gross torque output of 332 lbs. ft., at 1700 rpm. A most important characteristic of this engine is that it has a top operating speed of 2600 rpm. corresponding with gasoline engines of similar displacement.

The Hercules diesel engine is of solid injection compression ignition, 4-stroke cycle type. This means that with the 4 cycle design greater economy and more complete combustion is assured. Quicker dissipation of heat due to engine design provides longer engine life. Since the engine runs cooler it will develop a high mean effective pressure with less fuel consumption.

The D645 six-wheeler series diesel now available in addition to the D45 offers unusual fuel economy and power characteristics not usually found in vehicles of this weight classification for either heavy duty on or off the highway service. Having a gross vehicle weight of 38,000 pounds, the D645 diesel is available in two models with a choice of a tandem double reduction or worm drive rear axle. For exceptional rugged service where maximum gear reductions are required, auxiliary transmissions are available for these models.

POWER



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DIESEL ENGINES

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Plant Manager For Chicago Ry. Equipment Co.

MR. S. J. WALKER, President of the Chicago Railway Equipment Company, announces the addition to their staff of Mr. Charles E. Stevens, Jr., as Plant Manager.

Mr. Stevens has been associated witht equipment and heavy duty internal combustion engine manufacturing and engineering since his graduation from the Harvard Engineering School.

Since 1941 he has been with Fairchild Engine & Airplane Corporation, most recently as Chief Engineer of the Al-Fin Division of that concern.

In addition to his other duties, Mr. Stevens will direct the development work on the Al-Fin bimetallic aluminum bonded to iron brake drums, pistons and other bimetallic products for the Chicago Railway Equipment Company and its subsidiaries. The Chicago concern holds a license from Fairchild on the Patented bonding process.

Nordberg Receives Visit from Mayor of Quito, Ecuador

MAYOR Jose Richard Chiriboga Villagomez of Quito accompanied by Senor Richard Espinosa Palacios, manager of the Empresa Electricia Municipal of Quito, visited this country to discuss matters of mutual interest with officials in Washington, D. C. They spent a day touring the Nordberg plant in Milwaukee where they inspected the main propelling engine of the "Ciudad de Quito," one of three Flota Mercante Grancolombiana vessels which will be assigned to Ecuadorian trade. Two of these ships are now in service and the third is under construction by Canadian Vickers, Montreal, Canada.

Mayor Chiriboga told luncheon guests in Milwaukee that Ecuador is leading South American countries in current payments and has an enviable credit record. He said that although Ecuador was primarily an agricultural country, she has a great industrial potential. He also said that there was a need for American technicians in Ecuador.

Appointments At American Brake Shoe

J. H. Parsons R. B. Pogue

JOSEPH H. PARSONS and Robert B. Pogue have been appointed Vice-Presidents and Rosser L. Wilson has been appointed Chief Engineer of the Brake Shoe and Castings Division of American Brake Shoe Company. Mr. Parsons, formerly Assistant Vice-President, will be in charge of miscellaneous castings sales. He joined the company as an apprentice after graduation from Princeton University in 1913.

R. L. Wilson

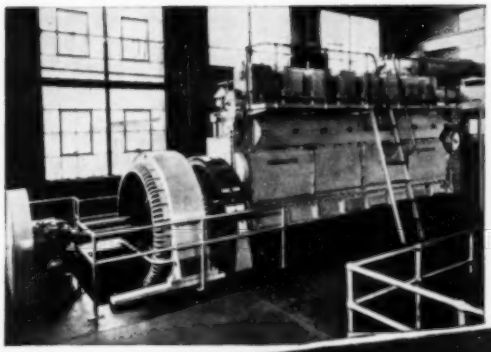
Mr. Pogue, formerly Chief Engineer, continues in charge of engineering. He has been with the Brake Shoe Company since 1916 and Chief Engineer of the division since 1937.

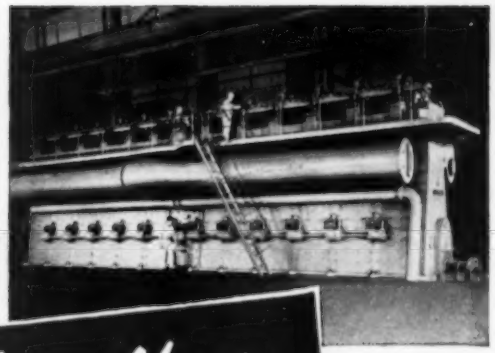
Mr. Wilson, formerly Assistant Chief Engineer, joined the company as an Engineer in 1935. He is a graduate of Purdue University.

Diesel Order for Lima-Hamilton

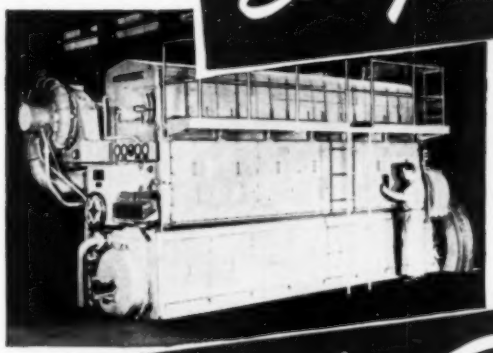
LIMA-HAMILTON Corporation announced today that the Baltimore & Ohio Railroad Company has ordered ten 1,000-horsepower diesel switching locomotives.

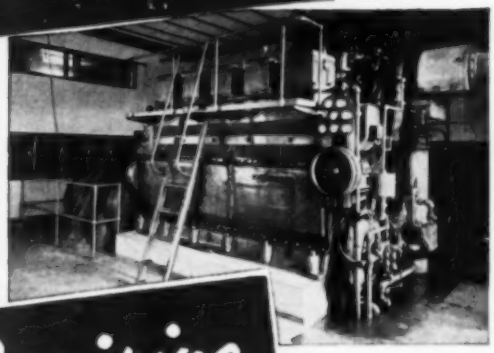
Units for the B & O are the same type of new locomotives recently delivered by Lima-Hamilton from its Lima Locomotive Works Division, Lima, Ohio, to the Nickel Plate, the Erie, and the New York Central.





Every One New...





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ADVANCED LUBRICANTS

DIESEL UNITS like these new "big babies" are a vitally important investment to any plant. They deserve and demand only the finest lubrication. Start them off with the right type and grade of oil and they will operate efficiently with little maintenance expense.

Take full advantage of the knowledge and experience of the Cities Service Lubrication specialists. These men are fully informed on the lubrication requirements of all the latest models. Their advice and recommendations can contribute to longer years of use, dependable and economical performance.

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We have a new 64 page manual entitled "Diesel Engine Lubrication." Write for your free copy of this fact-filled lubrication guide today.

CITIES SERVICE

Huber Announces Introduction of New Heavy-Duty Motor Grader

HUBER Manufacturing Company of Marion, Ohio, is announcing the addition of a new heavy-duty motor grader to its line of road construction and maintenance equipment.

The new Huber Grader is the result of many months of careful engineering study and planning and exhaustive tests in the field. A pilot model was built more than a year ago and subjected to thorough testing under actual operating conditions. The machine was in the hands of actual equipment users, both private contractors and political subdivisions, with satisfactory performance reports being made in every instance.

In designing this new unit, Huber engineers drew upon the company's past experience in grader production. Huber was actively engaged in the building of graders from 1921 until 1942, when this phase of the firm's manufacturing program was discontinued because of wartime demands for other types of road machinery.

Weight of the new Huber Grader is 24,500 pounds without scarifier and 25,800 pounds with scarifier. Blade pressure without scarifier is 12,440 pounds and with scarifier, 14,620 pounds. The scarifier attachment is offered as optional equipment. Overall length of the machine is 25′ 9½″, width is 7′ 10″ and height with cab 10′ 4″.

Outstanding features of the Grader include: Hydro-mechanical controls; 27½″ front axle clearance; 87″ shoulder reach; mechanical steering; Hercules 130 horsepower full diesel engine; 4-wheel hydraulic brakes and easy accessibility to all operating parts for maintenance and service purposes.

Other standard equipment includes electric starter; 12′ x 24″ x ¾″ moldboard with end bits; hood side doors; pre-cleaner for the air cleaner; leaning wheel front axle; six 14:00 x 24″ low pressure tires; genuine leather full-width seat filled with foam rubber.

Offered as optional equipment are enclosed safety-glass cab; "V" Type, 9-tooth scarifier with 46″ swath width; 2′ blade extension, right or left.

The Grader has eight speeds forward ranging from 1.31 to 20.63 miles per hour. There are two speeds reverse, 1.92-4.73 miles per hour. It's equipped with the Oliver transmission.

European Firm Manufactures Diesel Locomotives

IT is announced that an agreement has been concluded between General Motors Corporation, Electro-Motive Division, LaGrange, Illinois, and Nydqvist & Holm Aktiebolag of Trollhattan, Sweden, for the manufacture of diesel electric locomotives. Under this agreement Nydqvist & Holm will market in Scandinavia and overseas territories diesel electric locomotives embodying General Motors well known 567B locomotive diesel engine and other transmission components manufactured and supplied by General Motors, the mechanical and some electrical equipment of the locomotives being manufactured in Sweden by Nydqvist & Holm and other Swedish firms.

Purolator Appoints New Purchasing Agent

JOHN T. GAFFNEY, acting purchasing agent since May 1, has been appointed purchasing agent of Purolator Products, Inc., Newark, N. J., manufacturer of automotive and other types of oil filters and filtration equipment, President Ralph R. Layte announced today.

Mr. Gaffney joined Purolator in November, 1948, and became assistant purchasing agent last February. He was formerly with Simmonds Aerocessories, Inc., of Tarrytown, N. Y., and Remington Rand, Inc. A resident of Roselle Park, N. J., he attended White Plains, N. Y., High School and Pace Institute. He is a member of the Purchasing Agents' Association of New York.

They can't stand *Spots* before their *eyes!*

For Every Bearing

No, the people in our Quality Control Group can't stand even *one* spot before their eyes, when it comes to okaying a bearing, because they are passing on one of the most precise parts that goes into an engine assembly.

In the case of the plain copper-lead main bearing shown above, this okay must be given 87 times.

On more complex items—such as flanged bearings—an even greater number of tests is necessary.

These manufacturing controls pay off for you! They are your assurance of high quality and exact adherence to your specifications. You get maximum performance when you use Federal-Mogul *silent* sleeve bearings. Consult our engineers on your requirements.

HIGH SPEED, high temperature, automotive type bearings available in many combinations.

SPEED & LOAD bearings for pumps, compressors, industrial electric motors and similar uses.

HEAVY LOAD for big Diesels, power plants, etc.—bearings up to 27½" O.D., steel and bronze back.

BRONZE PARTS in many shapes, sizes; thrust washers, bushings; for many types of applications.

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FEDERAL Mogul — Silent SLEEVE BEARINGS

Two International Diesel Crawlers

NEW, more powerful, "A" models of the International TD-18 and TD-14 Diesel Crawler tractors, are announced by International Harvester Company. Both the TD-18A and TD-14A, now in production, have greater work capacities than previous models, and incorporate a number of new features designed for increased operator comfort and longer trouble-free service life.

The heavy-duty TD-18A, second largest in International's line of five diesel crawlers, has 87 drawbar horsepower, compared with 80.5 in the previous model. Net engine horsepower at the flywheel, which was 97 in the last model, is now increased to 107. Belt horsepower, previously 91.5, has been raised to 101.

In the TD-14A, third largest of the crawler line, horsepower has been increased to 76 at the engine flywheel; 60.5 drawbar, and 72 belt. With the added power, this tractor has higher maximum drawbar pull of 16,600 pounds in first gear. The TD-14A has the same speeds as the TD-18A.

Both tractors feature spring boosters on the steering clutch hand levers for greater ease of operation; a closed cooling system which prevents loss of coolant when the tractor is working on a steep grade, and also helps maintain proper engine temperature; and increased-efficiency lubricating oil filters which cut maintenance costs by greatly extending the usual oil change period.

The new-type lubricating oil filters have increased filtering area and require changing only every 240 hours of operation under normal conditions, compared to the previous 100-hour change period.

Specification sheets and catalogs on the TD-14A and TD-18A are available on request. Write the Consumer Relations Department, International Harvester Company, 180 N. Michigan Ave., Chicago 1, Ill.

New Casting Method

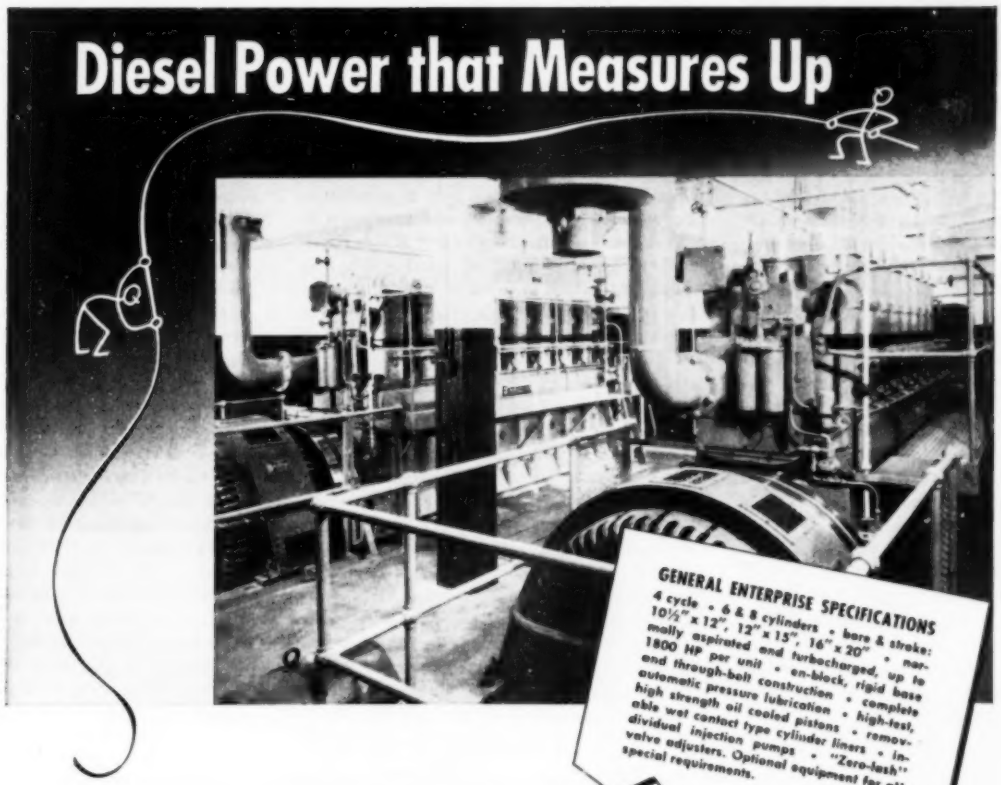
THE versatility and effectiveness of the new Bendix technique of plaster mold casting, capable of turning out units of intricate design, close tolerances, and critical surface finishes, is illustrated in these three pieces produced at the foundries of the Eclipse-Pioneer Division, Bendix Aviation Corporation, Teterboro, N. J. Upper left is a turbine for a torque converter unit, structurally complex yet economically produced on a mass production basis by the new method. Upper right is a ten-inch airplane landing wheel so accurately cast that only the hub requires machining. The new process permitted thinner, lighter walls, reinforced by internal ribbing, thus effecting a two-pound saving in weight without sacrifice in strength. The remaining part is a six-inch, two-stage, high-speed shrouded impeller with specifications calling for critical balance and satin-smooth inner surfaces. Cast in one piece the impeller has a web of vanes which were kept within tolerances of 0.005 inch while the entire unit has sufficient strength to withstand peripheral speeds up to 1500 feet per second—supersonic velocity.

Corrections

IN the article entitled "British-Built Diesel Electrics for Egyptian Railroad" appearing in our September issue, the picture on Page 57 showing the end view of the engine installation was printed upside down through a printer's error.

On page 35 of our October issue in the story "Big Western Trucker has Diesel Maintenance Know-How," it was stated that Garrett Freightlines paid $11,745.00 for diesel fuel in 1948. The correct figure is $291,723.10.

Diesel Power that Measures Up



GENERAL ENTERPRISE SPECIFICATIONS

4 cycle • 6 & 8 cylinders • bore & stroke: 10½" x 12", 12" x 15", 16" x 20" • normally aspirated and turbocharged, up to 1800 HP per unit • en-block, rigid base end through-bolt construction • complete automatic pressure lubrication • high-test, high strength oil cooled pistons • removable wet contact type cylinder liners • individual injection pumps • "Zero-lash" valve adjusters. Optional equipment for all special requirements.

-to your most exacting requirements

One thing you want in a Diesel engine is security against power failure. An unscheduled stoppage in your power source can spell a lot of trouble. It can cost you plenty for time out from doing its job—whether the application is in power plants, oil fields, pipe lines, dredges, industrial power or irrigation.

Yes, these and other power applications demand that Diesel engines measure up to specific high-performance requirements. Enterprise Diesels, conservatively rated for highest service in *any* job, put a stop to power failure worries. Continuous engineering advancement, backed by years of Diesel building experience, has always kept Enterprise Diesels a step ahead in new developments designed to provide *you* with the most modern, efficient power.

For dependable performance, look to Enterprise . . .

Choice of the Power Experts

WRITE TODAY!

New Bulletin No. 203 describes and illustrates the complete line of Enterprise Stationary Diesels and Generator Sets.

ENTERPRISE Diesels

ENTERPRISE ENGINE & FOUNDRY CO
18TH & FLORIDA STS., SAN FRANCISCO 10, CALIF. OFFICES IN PRINCIPAL CITIES

STEAM DONKEYS GIVING WAY TO DIESELS IN NORTHWEST WOODS

By W. J. GRANBERG

LAMENT as old-time loggers might, the venerable steam donkey engine, which for so long has enlivened Pacific Northwest forests with its whistle and plumes of steam, is on its way out—yielding to progress in the form of Diesel power for yarding operations. At least that is the indication, judging from five recent Diesel installations in Oregon woods. Up to now, loggers have believed that only steam could stand up under the rugged work of yarding, but comes now a practical and economical solution to this power problem through application of the torque converter to twin Diesel engines. As result, prospects are that logging operators will replace their steam donkeys with Diesel engines when full knowledge of this latest development is made available.

That is the opinion of H. J. Sundt, of Gunderson Bros. Engineering Corporation, Portland, Ore., Diesel distributors. His conclusion is based on successful operation of three Diesel-powered yarders by Western Loggers and two by the Valsetz Lumber Co., both of Oregon.

The new yarders are powered with twin diesel engines These two-cycle twins, with 12 cylinders in the mounted unit, have a brake horsepower of 300 at 1800 rpm. The engines are radiator cooled and electrically started. Fuel consumption, from actual field records, amounts to from 60 to 70 gallons in an eight-hour shift in the woods, operation of the new yarders reveals.

Hydraulic drive torque converters, were installed on the Diesel units. These converters have a mean specific torque of 300. Absorbing shock and assuring a smooth pull as they do, the converters mean longer life to logging rigging and reduced wear on the engine.

Representing a new application on twin engines, the torque master is installed on the Oregon yarder engines immediately behind the torque converters. The two-speed transmission multiplies the gear ratio of the yarding line drums by two making for tighter lines and better controlled lines when the going gets rugged, with no engine stalls. Shifting is automatic, and there are no gears involved in the installation. All of which means a steady, hanging-on power which formerly only the old-time steam donkey could provide.

Interest among loggers in this new application of Diesel power to logging is high, and Western Loggers sent its woods maintenance man, Gordon Jaynes, to the General Motors Diesel school for a course in operation and maintenance.

Gunderson Brothers' Engineering Corporation of Portland, Oregon are distributors for General Motors diesel engines described in this article. The torque converters were manufactured by the Twin Disc Clutch Company, Rockford, Illinois and the torque master was made by Western Gear Works at Seattle.

Logging operations with the accompanying unique handling problems, have long since seen many applications of the diesel engine. This latest application has opened up still further possibilities by again replacing steam power with the diesel engine as a source of dependable operation.

Two Diesel Electric Locomotives Saving $40,000 A Year At Calco Chemical

SAVINGS at the rate of more than $100 a day are being shown by two diesel-electric switching locomotives in the Calco Chemical Division of American Cyanamid Co. in Bound Brook, N. J. Total savings are averaging more than $40,000 a year.

The locomotives, one 44-tonner and one 65-tonner, both built by General Electric, replaced two steam locomotives and are used for transfer work and intra-plant switching.

In March, 1947, the 44-ton unit began its operations. The 65-ton locomotive was placed in service in May, 1946. Since then the average savings accrued by the units have been approximately $1700 per month per locomotive. Working 16 hours a day, the units have an availability of more than 95 per cent.

Fuel and maintenance have been the source of greatest savings for Calco. Fuel savings alone have averaged about $5 per hour for the two locomotives and maintenance figures have been about a dollar an hour lower than that required for the steam locomotives.

The General Electric locomotives are also saving Calco money through their ease of operation on sharp curves. With the old steam locomotives there was more than one derailment a week on the plant tracks. Since the purchase of the diesel-electrics there have been no derailments, because of their smaller, rigid wheelbase and smooth torque.

One official at Calco stresses the value of the diesel-electrics in operating safely in inflammable areas. The steam locomotives were constant dangers in the highly volatile atmosphere of some parts of the chemical plant.

Industrial Filter Folders Issued by Winslow

A NEW and unusually comprehensive series of folders dealing with industrial use of filters has been published by Winslow Engineering Company, of Oakland, manufacturers of Winslow filters.

Offered to dealers and distributors for use in contacting prospective customers, and also designed to answer inquiries emanating from readers of Winslow advertisements, the series consists of five folders, each discussing filtration problems in a different industry. The construction, petroleum, marine and trucks-and-buses industries are covered individually, while the fifth folder is concerned with all types of heavy industry.

The folders are distributed in an attractive outer binder, and anyone interested in securing copies of one or more of them may do so by writing to W. G. Nostrand, vice-president, Winslow Engineering Company, 4069 Hollis Street, Oakland 8, Calif.

New Booklet by Caterpillar

REFRIGERATION ASSURED WITH "CAT" DIESEL POWER, a new 8-page booklet describing the application of "Caterpillar" Diesel Engine and Electric Sets to cold storage and ice plants, has just been published by Caterpillar Tractor Co., Peoria, Illinois.

Photographs depicting food locker plants, ice storage rooms, a dairy, and a brewing company who depend on "Caterpillar" Diesel power help to convey the story of refrigeration techniques used in ice-making; cold storage of meat, poultry, fish, eggs, fruit, and vegetables; and liquid cooling processes.

The booklet may be secured by requesting Form 12433 from Caterpillar Tractor Co., Peoria 8, Illinois, or from "Caterpillar" Dealers throughout the United States and Canada.

1 plan helps prevent all 3

When you show the people in your company that you're interested in their welfare, they naturally react favorably. That's why *production goes up* when you boost your employee-participation in the Payroll Savings Plan. Here's how it happens:

The more U. S. Savings Bonds an employee holds, the more secure he feels. The more secure he feels, the greater his peace of mind—the more contented, careful, and productive he is on the job.

Those facts aren't just something we dreamed up. They're borne out in the experience of more than 20,000 companies promoting the Plan.

Everybody Benefits!

Bond sales spread the national debt, thus increasing our national economic security. And, of course, what's good for the nation is good for you and your business!

The individual Bond buyer gets back $4, when his Bonds mature, for every $3 he invested. That's a boon for him, and—multiplied by millions of Bond holders—represents a huge backlog of purchasing power that will help assure national prosperity through the years ahead.

Five Steps Boost Participation

1. See that a top management man sponsors the Plan.

2. Secure the help of the employee organizations in promoting it.

3. Adequately use posters and leaflets and run stories and editorials in company publications to inform employees of the Payroll Savings Plan's benefits to them.

4. Make a person-to person canvass, once a year, to sign up participants.

These first four steps should win you 40-60% participation. Normal employee turnover necessitates one more step:

5. Urge each new employee, at the time he is hired, to sign up.

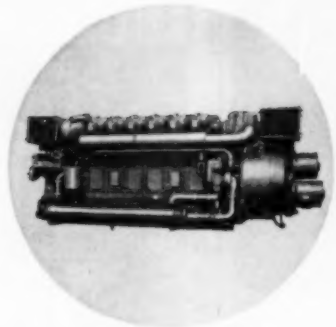
Nation-wide experience indicates that 50% of your employees can be persuaded to join—without high-pressure selling. All the help you need is available from your State Director, U. S. Treasury Department, Savings Bonds Division. He is listed in your telephone directory. Wouldn't it be a good idea to call him right now, while it's on your mind?

The Treasury Department acknowledges with appreciation the publication of this message by

R. F. Gaarmann

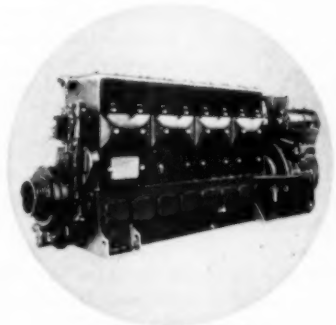
Editor—DIESEL PROGRESS

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and The Advertising Council.



F.V.L.-12T. Cooper Bessemer Diesel Engine

BIGGER TRAINS— FASTER SCHEDULES for the Argentine!



P.T.L. Superior Diesel Engine

The Argentine State Railways are being re-equipped with latest type Diesel-Electric motive power units including some of the most powerful meter-gauge locomotives of their class.

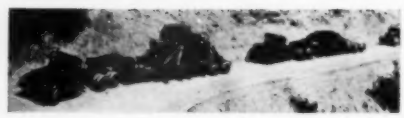
The fact that Bendix-Scintilla fuel injection has been chosen for the several makes of engines with which these units are powered is indisputable evidence of their consistent dependability and life.

An increasing number of Diesel engine users and manufacturers are specifying Bendix-Scintilla fuel injection equipment on their engines, not only because of its superior performance and reliability, but because Bendix-Scintilla fuel injection service is world wide.

BENDIX-SCINTILLA

SCINTILLA MAGNETO DIVISION of Bendix AVIATION CORPORATION
SIDNEY, NEW YORK
Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.

Diesels Move 60-Ton Turbine Rotor



Load: Turbine rotor, weighing 60-tons, less blades. Gross weight of rotor, Kenworth truck-tractor powered with Cummins HB-600 diesel engine, and low-bed carryall was 192,000 lbs. (Pictures 1 and 2) The rotor is the property of the Pacific Gas & Electric Co., and was shipped from Oakland to Dobbins, Cal., about 135 miles, for use in the Colgate Power House. The rotor had to be transported less blades due to several low bridges, the overall height of complete unit being too great. Carrier: Bigge Drayage Co., Oakland, Cal. Equipment: Three Kenworth trucks with 150-hp Cummins diesels; one pulling, second carrying rotor blades and other equipment, also adding a push or pull on upgrades to 12%, and holding back on heavy down grades. Third one for insurance against break-down. (Picture 3)

Route: Load was transported by special permit, over state highways during daylight hours during two days of travel. On certain of the highways it was necessary to add a special low bed trailer "jeep," to put the rotor load on a total of 26 tires. (Picture 4)

New Air and Oil Filtration Catalogue

A NEW and comprehensive catalogue covering all phases of air and oil filtration has just been issued by Air-Maze Corporation. Profusely illustrated with photographs of numerous units for all kinds of applications and with many sectional views and diagrams, this catalogue offers complete documentation on the latest developments in air and liquid filtration. It may be had free from Air-Maze Corporation.

WALWORTH LUBRICATED PLUG VALVES

offer these advantages

- . . . Direct port opening
- . . Quarter turn opens or closes valve
- . . . Dead tight shut-off
- . . . Freedom from attack by fluids being handled
- . . . Pressure sealed
- . . Made in a complete line. Sizes from ½" to 26" for pressures from 175 to 5,000 psi., and for vacuum requirements

THESE are just a few of the reasons why Walworth Lubricated Plug Valves give "top" performance on many *difficult* services.

All Walworth Lubricated Plug Valves employ special insoluble lubricants which protect the plug and body against contact with the line fluid, thus combatting erosion and corrosion.

The lapped surfaces of the valve are "pressure sealed" when the valve is in either the open or closed position. By turning the lubricant screw, lubricant is forced under high pressure through a grooving system that completely encircles the ports as well as the top and bottom of the plug.

The lubricant seals the valve against leakage, and reduces friction between plug and body. This permits easy, quick, full-opening, or tight shut-off with only a quarter turn of the plug.

Number 1700 (illustrated) is a Steel-iron valve, wrench operated, designed for a working pressure of 200 pounds WOG (water, oil, or gas). Valves are available in either screwed or flange types. Screwed type have API line pipe thread lengths. Flanged type (No. 1700F) is faced and drilled to American Standard for 125-pound cast iron flanges unless otherwise specified.

For further information about No. 1700 as well as the complete line of Walworth Lubricated Plug Valves, write for catalog.

WALWORTH

valves and fittings

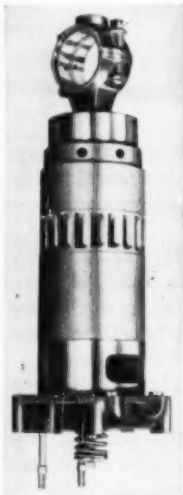
60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

Two Cylinder—Two Stroke—High Speed Light Weight Diesels

THE Diesel Division of the Harnischfeger Corp., at Port Washington, Wis., has introduced a new two cylinder, two stroke, high speed diesel engine for all uses.

This new engine uses the patented P&H cylinder head and liner assembly. A cut of this power head is shown at right. This unit has a 4½ inch bore by 5½ inch stroke and is the heart of the P&H diesel. The cylinder head is interchangeable from one engine to another and is removable in a period of forty minutes, which provides a great saving in time on any maintenance work and reduces the cost on major overhauls. Liners are of hardened steel alloy for longer wear. The entire assembly is completely water jacketed and thoroughly cooled. Water travels upward in the liner and passes between each intake port thoroughly controlling the temperature at that point. The intake ports are special machined on a compound angle sending the air from a root-type blower into the cylinder in a strong swirling motion—providing complete combustion on next stroke.



Several years ago the Harnischfeger Corporation decided to develop a diesel engine. Karl P. Schoeppner, who was experienced with both foreign and domestic diesel engines, was put in full charge of this developing program. The six cylinder and the three cylinder has demonstrated its ability and stamina in all parts of the United States and Canada on P&H excavators, power units, pumping units, generator sets, road graders, crusher and screening plants; and now the two cylinder is ready to be added to the complete line of engines.

This two cylinder diesel engines is 28¼ inches wide, 40⅞ inches high and 32¼ inches long. Weight, complete with cast light metal alloy block, 1030 pounds with a horsepower rating of 52.5 at 1400 rpm. The engine operates on a 16 to 1 compression ratio with a displacement of 174 inches. The extra heavy crankshaft is specially hardened and magnaflux tested.

The injector and fuel injector pumps are standard makes. The injector is a simple and efficient unit. Each individual injector has a large spray hole to eliminate clogging difficulties. One injector for each cylinder is conveniently located for rapid change when necessary. The injector pump is also standard. It is demountable and very simple and easy to remove when necessary. These units are also exchangeable from one engine to another.

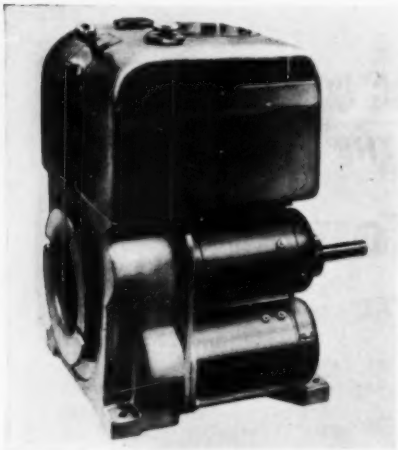
These engines are well suited for economical operation—on one, two or three bottom farm tractors, road grader application, crusher and screening plants—besides the regular use in power units, pumping units, electric generator plants and marine propulsion and auxiliary engines. The P&H diesel line ranges from 20 hp. to an intermittent rating of 175 hp. in the six cylinder. The Diesel Engine Div. of the Harnischfeger Corporation is now appointing distributors in all parts of the United States and will shortly consider foreign markets. For further information on these engines, write direct to the Diesel Engine Division, Harnischfeger Corporation, Port Washington, Wisconsin.

Sales Report by Atlas-Imperial

ATLAS IMPERIAL DIESEL REPORTS SALES . . . Third quarter reports to SEC by Atlas Imperial Diesel Engine Co. show a sales volume of $4,000,554 in three months ended August 31, third quarter of fiscal year, compared with $1,975,550 a year ago, bringing nine months' sales to $7,777,218 against $7,071,994 in like 1948 period.

Diesel Engine Catalog is just off the press in its Fourteenth Edition. See the unique Diesel Horsepower Range Chart — invaluable aid to design engineers and buyers. ORDER COUPON ON PAGE 81.

New Light Weight Diesel



Nemec diesel engine

A LIGHT and compact diesel engine offered to the public is represented by a 5 HP, 2 Cycle air cooled model that weighs less than 100 pounds.

Nemec Combustion Engineers of Whittier, California, are the manufacturers, and they announce that the new model will be available in quantity before the first of the year, as all basic heavy machinery is installed and operating and practically all tooling has been completed. This engine has been on the test block for over a year in its present form, and prior to that has had eight years of development and research work including the construction of several test models of various sizes to prove the new principles involved.

The work is under the direct supervision of Harold M. Dudek, the inventor and designer. Nemec combustion engineers have been active in the manufacturing of combustion equipment, jet propulsion units and various equipment since 1922, and their factory covers 32000 sq. ft. of floor space and is well equipped with automatic production machinery.

A unique feature of this engine is the crank case breather prevents the usual seepage of oil through oil seals, filler pipe or other openings; this makes the engine very clean. The end bells or bearing housings are bolted to the crank case and are readily removable. The bearing housing on the flywheel end has built into it the lubricating oil pump and the cam push rod assembly. Pressure lubrication of the entire engine is provided for by force feed with engine in any tilted position.

Four main bearings carry the crank shaft. One tapered Timken and one 1¾" needle type roller bearing are mounted on each end of the crank shaft, thus providing double the bearing area normally furnished on engines of this size. Crank shaft is alloy steel. Connecting rod bearings are both needle type of heavy design. The cylinder is one piece alloy aluminum casting with integral head. Cylinder liner is an alloy steel sleeve precision honed. The combustion chamber is the energy cell type with removable cell assembly without dismantling the cylinder.

The most outstanding features of this new engine is the injector which is entirely revolutionary in design and action. It meters the fuel precisely in quantities from one-tenth Cu. MM to 30 Cu. MM per injection and at speeds up to one thousandth of a second per injection while maintaining any desired spray pattern. This injector is unique in that no closely fitted parts are required and tolerances of .001 inch are ample instead of the usual lapped tolerances of fractions of a tenth of a thousandth.

The injector and fuel pumps are all in one assembly so that there are no connecting tubes. In fact there are no fuel lines or other piping on this engine as all parts are connected by ports in the castings and the injector fuel supply is admitted through ports that line up when the injector is screwed into place. Servicing is especially easy as all moving parts are removable.

All accessories will be available with this engine including a 2½ KW direct connected generating plant, which is permitted by the smooth power flow of the two cycle power.

A special arrangement has been worked out to permit the installation of this air cooled motor in yachts for auxiliary power or generating, where the ordinary air cooled motor cannot be installed on account of the large air ducts required. No air ducts are required with this arrangement.

SPECIFICATIONS

Bore and Stroke	2.75 x 2.75"
Displacement	16 Cu In.
Compression Ratio	18:1
HP at 2500 RPM	6
Continuous Rating at 2500 RPM	4.7 HP
Solid Injection at 6000 PSI	
Wt. Hand Start Model	98 lbs.
Electric Start Model	130 lbs.
One Cylinder Air Cooled 2 Cycle	
Dimensions L 17" W 14½" Height 18½".	

Evening Courses in Diesel Instruction

THE Chicago Board of Education has recently originated a course in diesel training for men to run and maintain diesel engines, to be held at the Manly Trade and Vocational School, Tuesday, Wednesday and Thursday evenings from 6:30 to 9:30 P.M. The course will pertain to operation, maintenance and overhaul of various types and makes of diesel engines. Registration is $5.00 for a year and further information can be obtained from Mr. William A. Sears at the school.

Sales Manager for Sperry Products

L. F. A. MITCHELL has been appointed sales manager of Sperry Products, Inc., Danbury, Conn., it has been announced by J. B. Farwell, president.

Mr. Mitchell will be responsible for the administration of sales of Sperry non-destructive testing services and equipment, including detector car service, ultrasonic testing equipment and commercial testing service, and of industrial and marine hydraulic apparatus. Previously, he was manager of headquarters sales, Crocker-Wheeler Electric Mfg. Co., and prior to that was associated with Westinghouse Electric Corporation at East Pittsburgh, Pa., in various sales supervisory capacities and manager of sales for Canadian Westinghouse Co.

New Tube Fitting

A NEW "clinch-type" fitting for use with any type of metal or plastic tubing has been developed by the Crawford Fitting Company, Cleveland 17, Ohio. Prior to its introduction, it was given exhaustive tests in actual service in chemical, process, power and other industrial installations.

Marketed under the trade name of "Swagelok", these new fittings provide leakproof seals at three points. Two ferrules and a threaded chuck clamp around a tube with virtually no effect on the inner walls, thus leaving the flow of liquids or gases completely unimpeded. Tests have indicated that tubing will burst before these fittings themselves will leak. The axial support which "Swagelok" fittings lend to a tube assembly tends to drive vibration away from the fitting, thereby minimizing fatigue.

New Representative for Lima-Hamilton

HENRY VOGEL, 4506 Wentworth Avenue, Baltimore, Maryland, has been appointed representative in the Baltimore Territory for Lima-Hamilton Corporation, Lima, Ohio. Products to be handled are diesel and steam locomotives and parts therefor.

Bulletin on New Absolute Pressure Recorder

A BULLETIN on the company's new Series 500 Absolute Pressure Gauges has just been published by The Bristol Company, Waterbury 91, Conn. It describes the instrument and gives data on the new principle of operation employed, which makes it possible to accurately record and automatically control absolute pressure within a scale range as low as zero to 20 millimeters of mercury absolute. Copies of this bulletin, No. G620, are available from The Bristol Company, Waterbury 91, Conn.

Mack Appoints Caley Branch Manager

John G. Caley

JOHN G. CALEY has been appointed District Manager of the Mack Truck Company's Birmingham (Ala.) direct factory branch, it is announced by A. C. Fetzer, vice president and general sales manager. In assuming his new duties, Mr. Caley relinquishes those of manager of the National Accounts Department for Mack's Southern Division.

Mr. Caley has had many years experience in the trucking business. Before becoming associated with Mack he was connected with the Carley Trailer and Equipment Company of Atlanta, and during the war he was Regional Director for the Office of Defense Transportation in the Southeast. Previously, he was vice president and general manager of Transportation, Inc., for a number of years.

Mr. Caley is a former president of the Motor Transport Association of South Carolina, and a former director in both the North Carolina and Georgia Truck Associations. He has served as president of the Irregular Route Common Carriers Conference of the American Trucking Associations and as a member of the Executive Committee of the American Trucking Associations.

Cooper-Bessemer Transfers Sales Engineer

C. W. Woltz

CLIFTON W. WOLTZ, Cooper-Bessemer Corporation sales engineer, has been recently transferred from the company's headquarters at Mount Vernon, Ohio, to the Dallas branch office. Mr. Woltz will continue in the capacity of sales engineer in the Texas area for all types of gas, diesel engine and compressor installations. He is a graduate mechanical engineer from Case Institute of Technology and holds a lieutenant's commission in the USNR, having served three years in the Navy during the war.

Vice President for Elliott

C. A. Butcher

JEANNETTE, Pa.—Charles A. Butcher has been elected a vice president of Elliott Company effective September 16, 1949. According to Grant B. Shipley, Chairman of the Board, Elliott Company, Mr. Butcher will continue to function as general manager of the Crocker-Wheeler Electric Manufacturing Co., Ampere, N. J., a recently acquired division of Elliott Company. Mr. Butcher is a native of Iowa and received his B.S. and E.E. degrees from Iowa State College. He has more than 30 years of experience in many phases of the electrical field, and has several patents to his credit, including an automatic switch for controlling circuit breakers, which is used throughout the world in power supply apparatus for electric railway systems. He has been identified with the design and manufacture of power supply apparatus for numerous American and foreign electric railway and power systems.

Ralph Doherty Named Pedrick Division Manager

Ralph Doherty

ANNOUNCEMENT has been made by W. E. Wilkening, vice-president in charge of sales for Wilkening Manufacturing Co., maker of Pedrick Piston rings, Philadelphia, of the appointment of Ralph Doherty as Division Manager of the areas comprising generally the West North Central States. He will headquarter in Kansas City. Mr. Doherty is a graduate of the University of Arizona, worked for 5 years with Stuckey Auto Supply, of Phoenix, Ariz., for 12 years with Aluminum Industries of Cincinnati (Permite) as Western Sales Manager, then Eastern Sales Manager, and for the past 2 years as manager of the Automotive Div. of Service Supply Corp., of Philadelphia.

Mack Secures Order for Diesel Buses

AN order for 300 diesel transit-type buses has been placed with Mack Manufacturing Corporation by the Trustees of the International Railway Company, Buffalo, N. Y. The order consists of 240 45-passenger and 60 37-passenger Mack diesel buses which are to be used to improve transportation in Buffalo and Niagara Falls. Diesel-powered vehicles were specified by the Railway Company trustees in view of the overall economy inherent in diesel operation resulting from lower cost fuel and higher mileage per gallon.

The following are manufacturers whose engines are fully described with tabulated specifications:

American Locomotive Company
Atlas Imperial Diesel Engine Co.
Baldwin Locomotive Works
Buckeye Machine Co.
The Buda Engine Co.
Burmeister & Wain
Caterpillar Tractor Co.
Chicago Pneumatic Tool Co.
Clark Brothers Co., Inc.
Consolidated Diesel-Electric Corp.
Continental Motors Corp.
Cooper Bessemer Corp.
Crofton Diesel Engine Co., Inc.
Cummins Engine Co., Inc.
Enterprise Engine & Foundry Co.
Fairbanks, Morse & Co.
Flagship Engine Co.
Fulton Iron Works Co., Inc.
General Motors Corp.
  Cleveland Diesel Eng. Div.
  Detroit Diesel Engine Div.
  Electro-Motive Div.
Gray Marine Motor Co.
Hallett Manufacturing Co.
Harnischfeger Corp., P & H Diesel
Hercules Motors Corp.
Hill Diesel Engine Co.,
  Div. of Drake America Corp.
Ingersoll-Rand Co.
International Harvester Co.
Kermath Manufacturing Co.
The Lathrop Engine Co.
Lima Hamilton Corp.
Lister-Blackstone, Inc.
Mack Manufacturing Corp.
Mechanical Equipment Co.
Murphy Diesel Co.
National Supply Co.
Nordberg Manufacturing Co.
Palmer Brothers Engines, Inc.
The Rathbun-Jones Engineering Co.
John Reiner & Co., Inc.
R. H. Sheppard Co.
Stewart & Stevenson Services, Inc.
Sun Shipbuilding & Drydock Co.
The Union Diesel Engine Co.
United States Motors Corp.
Venn Severin Machine Co.
Washington Iron Works
Waukesha Motor Co.
White-Roth Machine Co.
Witte Engine Works
Wolverine Motor Works, Inc.
Worthing Pump & Machinery Corp.

Vibration Control Bulletin

Typical equipment installations calling for highly efficient vibration, shock and noise isolation are illustrated in a new 4 page bulletin just released by the Korfund Company 48-20 B Thirty Second Place, Long Island City 1, N. Y.

Six sizes of isolation mountings are described, all utilizing steel springs as the isolating medium together with resilient snubbers to absorb lateral thrusts. Loading range is from 75 lbs. to 12,000 lbs. per isolator, and dimensions are tabulated for each type. All have adjustable bolt to hold machine in place and to provide a means for leveling the equipment.

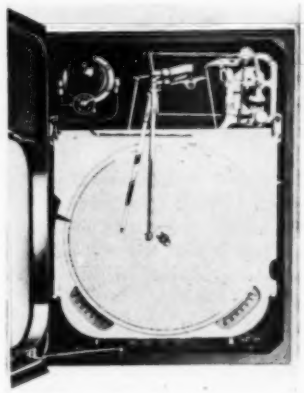
The high efficiency of these vibro-isolators makes it practical to place machines where they belong in the plant layout with significant savings in materials handling time and costs, and with actual increases in production. Other advantages claimed are improved working conditions, lower building and machine maintenance, reduced foundation costs, and reduced work spoilage. Ask for Bulletin LK551.

Management Consultant for American Bosch

MR. W. HUBERT BEAL, of Philadelphia, Pennsylvania, has been appointed Management Consultant of the American Bosch Corporation, Springfield, Mass.

Mr. Beal is well known in automotive circles—having been President of Lycoming Manufacturing Corp., Williamsport, Pa., many years.

New Line of Air-Operated Control Instruments



A NEW line of air-operated control instruments, known as the Series 500 Controllers, has been announced by The Bristol Company, Waterbury, Conn. Included are controllers for automatically controlling temperature, pressure, flow, liquid level, humidity, and pH value. The new controllers have calibrated control actions. Reset rate, derivative time, and proportional band adjustments are accurately calibrated and reproducible. They have only one service adjustment. Controllers can be completely disassembled and after being reassembled, with replacement parts, only one adjustment is required to put the system in exact calibration. All Series 500 Reset Controllers are equipped with reset action stops.

The new instruments are offered in five types of control action: on-off, proportional, reset, derivative, and reset plus derivative. The instruments are readily convertible from one type to another.

Shortest Chassis Diesel Truck Ever Built

SHORTEST chassis ever built with a Diesel engine by Kenworth Motor Truck Corporation, Seattle manufacturer of heavy duty trucks and buses, is this Model K521CT, one of the trucks delivered recently to Pacific Freight Lines of Los Angeles, a leading truck operator of the West. With a wheelbase of only 114 inches—same as that of a small passenger car—this Kenworth chassis is especially designed to permit the hauling of two 24-foot double bottoms and still come within a 60-foot overall length. Powered by Cummins HRBS diesel engines, these light weight, cab-over-engine Kenworth trucks provide more space and still meet legal length restrictions. Aluminum is used extensively in these models to assure exceptional light weight. Similar chassis are also being built by Kenworth to incorporate a sleeper compartment as an integral part of the cab design.

West Coast Diesel News

By FRED M. BURT

LAUNCHED at Sterling Shipyards, Vancouver, new British Columbia salmon seiner 65′ *Cape Churchill* (also sister ship *Cape Chacon*), powered with D17000 "Caterpillar" diesel engine, 159-hp, for Canadian Fishing Co., skipper Nick Perdia, designed by H. C. Hanson, Seattle.

THE NEW 110′ wooden tuna clipper *Vera M.* built by San Diego Marine Construction Co., for Coast Fishing Co., Wilmington, Calif. is powered with a 600-hp General Motors diesel, with 2½:1 Falk reduction gear; auxiliaries three 60-kw G.M. diesel generating sets.

ARIZONA Equipment Sales, Inc., Phoenix, Ariz. state distributors for Atlas Imperial diesel engines, have installed the second Atlas Model 8GS668, 290-hp natural gas engine at the Santa Cruz Farms, for the DeArrigo Bros., for irrigation purposes.

THE *Betsy Ann*, a San Diego Kettenburg-38, has been re-powered for the Albacore season with a 3-cyl. 60-hp General Motors diesel, with 4½:1 hydraulic reduction gear; supplied by Crofton Diesel Engine Co., from San Diego branch.

SUPPLIED by Waukesha distributor, N. W. Motor Parts Mfg. Co., Seattle, to Ozett Timber Co., Olympic Peninsula, two Model 148-DK, 175-hp Waukesha diesels equipped with Twin Disc torque converters to re-power Washington Iron Wks. yarder.

THE *Alalunga*, Paul Cooper, Master, one of finest sportfishers on Pacific Coast, based at Newport Beach, Calif. was recently re-equipped with two new Graymarine diesels, each developing 225-hp at 2000-rpm.

FOR San Francisco combination boat, *Anna B.*, skipper Frank Bramante, from Thos. A. Short Co., new, higher-powered "Caterpillar" D318, replacing 10-yr. old "Cat" D4600; also Twin Disc 3:1 reduction and reverse gear, and Exide batteries.

THE FIRST to be installed in the Southwest, a new Model NHRBS-600, 6-cyl., 300-hp Cummins diesel engine in an International tractor for use

as heavy duty transportation power unit, pulling low bed trailer etc., at Auburn, Calif. for Bean Construction Co.

AT RECENT election, new officers for Hallet Mfg. Co., Inglewood, Calif.—Austin Sherman, Pres; Wm. D. Brumbach, Vice Pres. (in charge of sales) and W. W. Shrein, Secy-Treas; the company's new Model AC-1, 5-hp air-cooled diesel engine is meeting with wide acceptance, particularly in South America; large numbers have been sent to Brazilian distributors in Rio De Janeiro, Sao Paulo, and nearly 20 other distribution points—used in irrigation, generating sets, small coffee-hulling machines etc.

THE NEW 57' purse seiner *Mary M. Katich*, built for Mike Katich of Gig Harbor by Kazulin-Cole shipyard, Tacoma, is powered with a Model D13000, 120-hp, Caterpillar diesel turning a 32 x 32 Coolidge wheel through a 2:1 Western hydraulic reverse and reduction gear.

NEVIS Truck Lines, contract hauler for Columbia Steel Co., Pittsburg, Calif. is converting the fleet of 14 Peterbilts from Cummins HB, 150-hp diesels to 200-hp, Model NHD-600, also adding 8 new Peterbilts with the higher-powered diesels.

RECENTLY completed at A. C. Benson Shipyard, Coal Harbor, Vancouver, for Stradiotti Bros. the flagship of their towing fleet (towing rafts on Fraser River, Howe Sound), the 42' *Strady V.* powered with a 500-hp, 8-cyl. Model 268-A, General Motors diesel engine.

COAST-LINE Truck Lines, of Watsonville, Calif. have added 10 new Peterbilts powered with 275-hp NHBS-600 Cummins diesels, for use in their "hot-shot" San Francisco-Los Angeles freight run.

FOR THE baby tuna clipper *Bond*, skipper Carl Gertz, also owner with Paul Ames and Jack Gosser, fishing for Van Camp Sea Food Co., San Diego, a new 18-hp, 2-cyl. Hallet diesel for auxiliary.

LATEST addition to seven vessel fleet of Westminster Tug Boats, Fraser River, B. C., is the *Westminster Monarch*, Capt. Mungo Duncan, master; which has been powered with a 500-hp General Motors diesel.

POWERED with 22-hp Graymarine diesel auxiliaries, two new 38's from Kettenburg Boat Works delivered to Lake Washington Yacht Basin, Seattle—the *Ono* for Dr. Herbert Day, the *Panacea* for Dr. George Reeve.

A NEW branch of the West Coast Engine Equipment Co., Berkeley has been opened in Sacramento under management of Gene Rhea, one of the partners of the firm; basically a service shop specializing in GM and Continental motor repairs, with four men in the shop, one in parts, one on the road. The company recently installed GM diesel compressor sets in USCG lightships 76 and 83.

TO HAVE as propulsion engine a 500-hp Fairbanks-Morse Model 31A, 8-cyl. diesel, with two 30-kw diesel generator sets for auxiliaries; a 93' fishing boat for research is being built by the Western Boat Bldg. Co., Tacoma for the U. S. Fish & Wild Life Service, for work in the North Pacific; designed by W. C. Nickum & Sons, Seattle naval architects.

FOR Martin Construction Co., Tuscon, Ariz. a new Model 148-DK, 175-hp Waukesha diesel to re-power a 1½ yd. Koring shovel; from Waukesha South Western, the Arizona Waukesha distributor.

THREE newly and specially equipped, diesel-powered boats for Alaska Dept. of Health to serve isolated settlements as floating health clinics—105-ft. power barge *Health*, two 135-hp Caterpillar diesels, 165-hp GM for X-Ray machine, 5-kw Lister-Blackstone for 110-volt AC; *Hygiene* with two 6-cyl 320-hp Atlas diesels; *Yukon Health* with two 165-hp diesel driven Harbor Master units.

On F-M Sales Staff

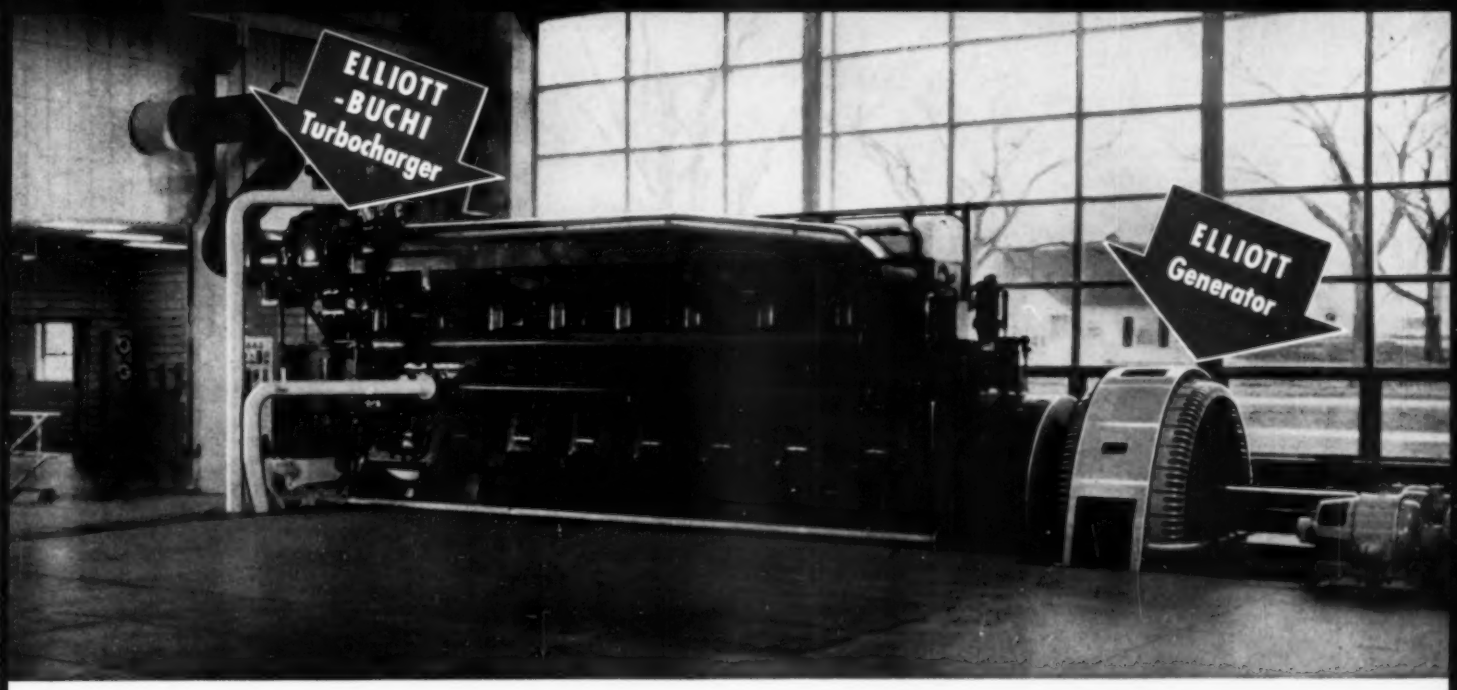
D. C. Prescott

DANIEL C. PRESCOTT has been appointed to the locomotive sales staff of Fairbanks, Morse & Co., Chicago manufacturers, in the Chicago District. Mr. Prescott has been associated for the past four years with the Sales Department of the Baldwin Locomotive Works in the Chicago area, and for nine years prior to that time was connected with the Mechanical Department of the Union Pacific Railroad at Omaha, Nebraska.

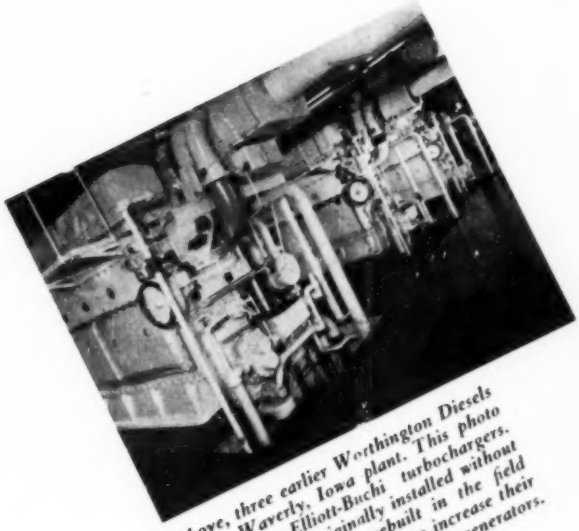
He is a native of Spokane, Washington, and after graduation from the University of Idaho with a B.S.M.E. degree, he was employed for several years by General Steel Castings Corp., at Granite City, Illinois.

He has a wide background in railroad mechanical research and materials design having served all of his time since graduation either with manufacturers of railroad equipment, or directly connected with a railroad.

ADVERTISER'S INDEX



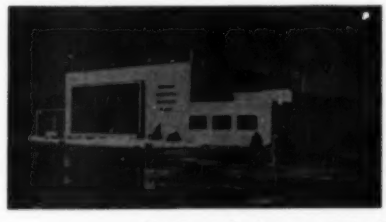
Two-way boost by *Elliott*



Above, three earlier Worthington Diesels in the Waverly, Iowa plant. This photo shows the Elliott-Buchi turbochargers. These engines originally installed without turbochargers, were rebuilt in the field and turbochargers added to increase their rating, with new, larger Elliott generators.

On your left, the Elliott-Buchi turbocharger, which is driven by engine exhaust to force clean fresh air into the cylinders, effecting complete scavenging, ideal combustion, and the ultimate in power from any 4-cycle Diesel . . .

On your right, the Elliott Fabri-Steel generator, built with the crack-proof stiffness of all-welded steel in frame and rotor, and with many exceptional features calculated to turn every unit of hp delivered by its fine Worthington Diesel into smoothly-purring kw.



This installation, rated 1245 kw, is a recent addition to the municipal plant of the thriving center of Waverly, Iowa. It is housed in an attractive new building, modernly designed, lighted and equipped, and one of which the community it serves may well be proud.

Details and data on Elliott-Buchi turbochargers and Elliott generators in fully descriptive bulletins, on request.

ELLIOTT COMPANY

Supercharger Dept., JEANNETTE, PA.

Electric Power Dept., RIDGWAY, PA.

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Elliott FABRI-STEEL GENERATORS
-BUCHI TURBOCHARGERS

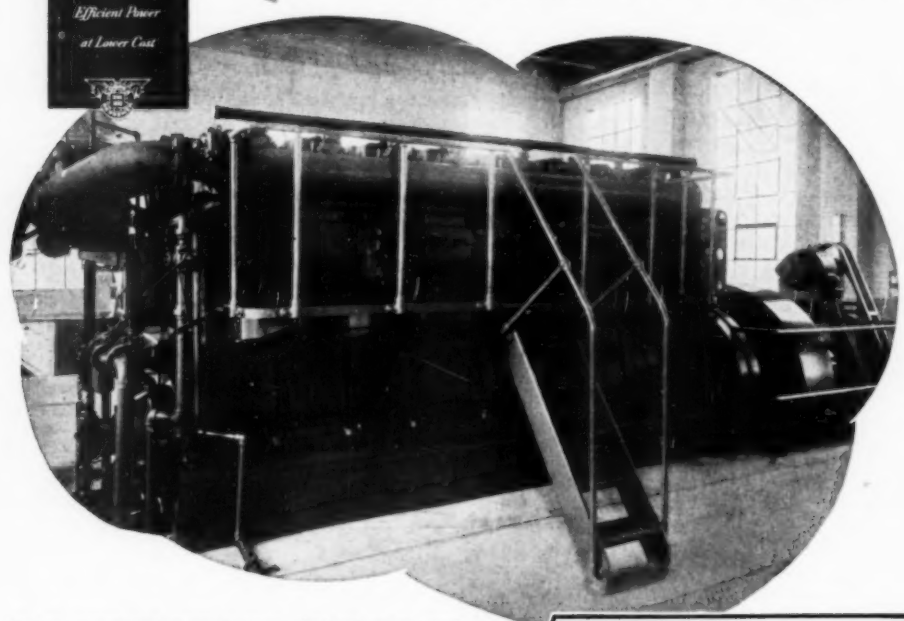
THEY BRING OUT THE BEST IN DIESELS

Hominy saves $1148 a month on fuel with Cooper-Bessemer gas-diesel

Hominy, Oklahoma, is typical of hundreds of cities in a position to cut way down on the cost of producing electric power. Here, a new-type Cooper-Bessemer gas-diesel, running largely on gas fuel, saves $1,148 a month compared with oil operation when using fuel oil at 10c a gallon.

Also significant is the fact that this saving is based on no more than 40% load! Cooper-Bessemer's latest gas-diesel development makes these engines more efficient even at partial loads than any other known engine of any type.

If gas is available to you, even in varying volumn, chances are you can make big savings with a Cooper-Bessemer gas-diesel. These dependable, long-lived engines are thoroughly proved in hundreds of money-saving installations. Why not check with the nearest Cooper-Bessemer office for reliable data on operating cost as determined by your conditions?



● This supercharged Cooper-Bessemer gas-diesel engine, rated 985 hp. drives a 680 kw generator in the Municipal Electric Plant of the City of Hominy, Oklahoma. Unit was installed late last year and will quickly pay for itself in fuel cost savings.

The Cooper-Bessemer Corporation

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